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VOL. 3 NO. 9

portable 100/200/600

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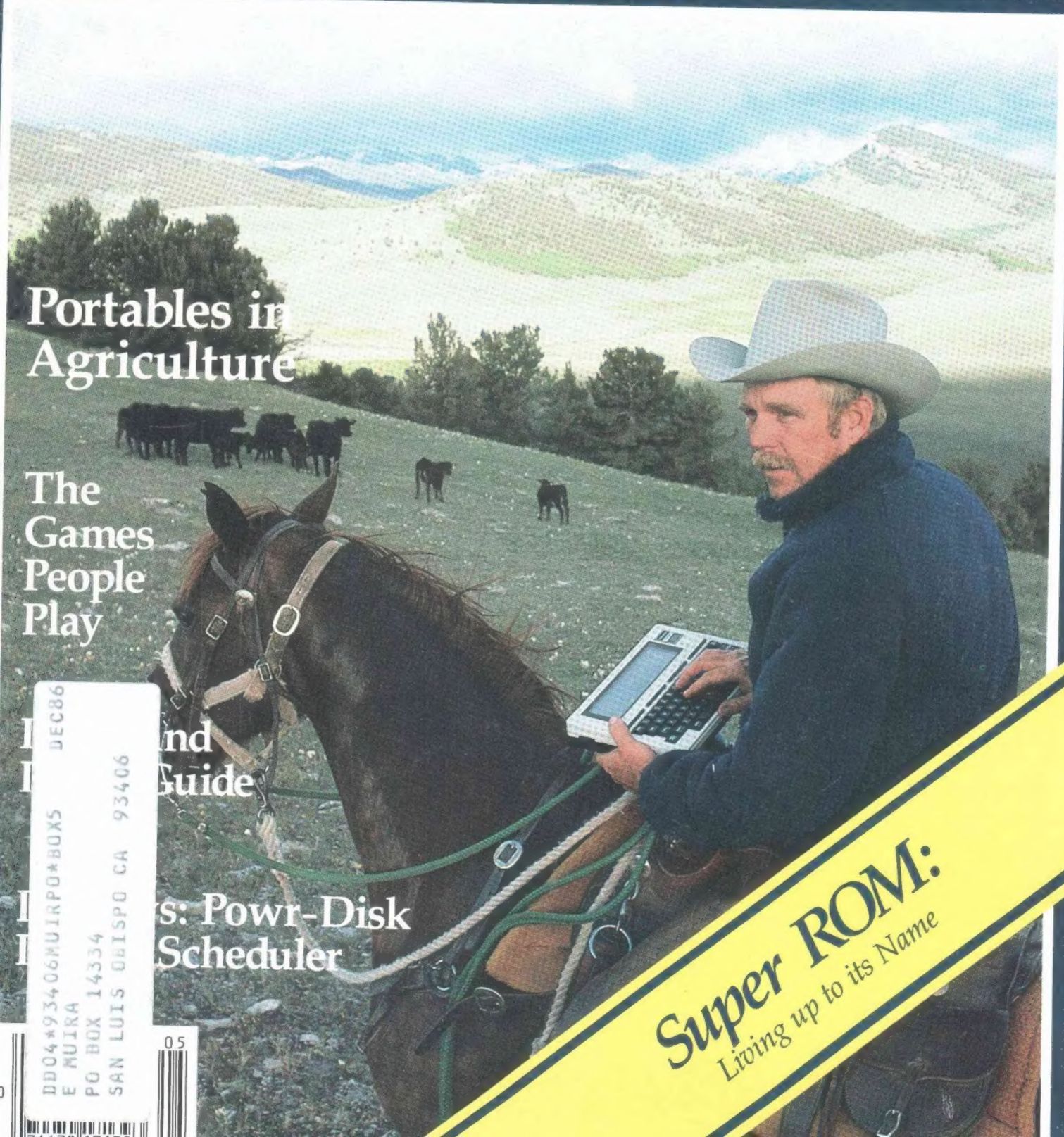

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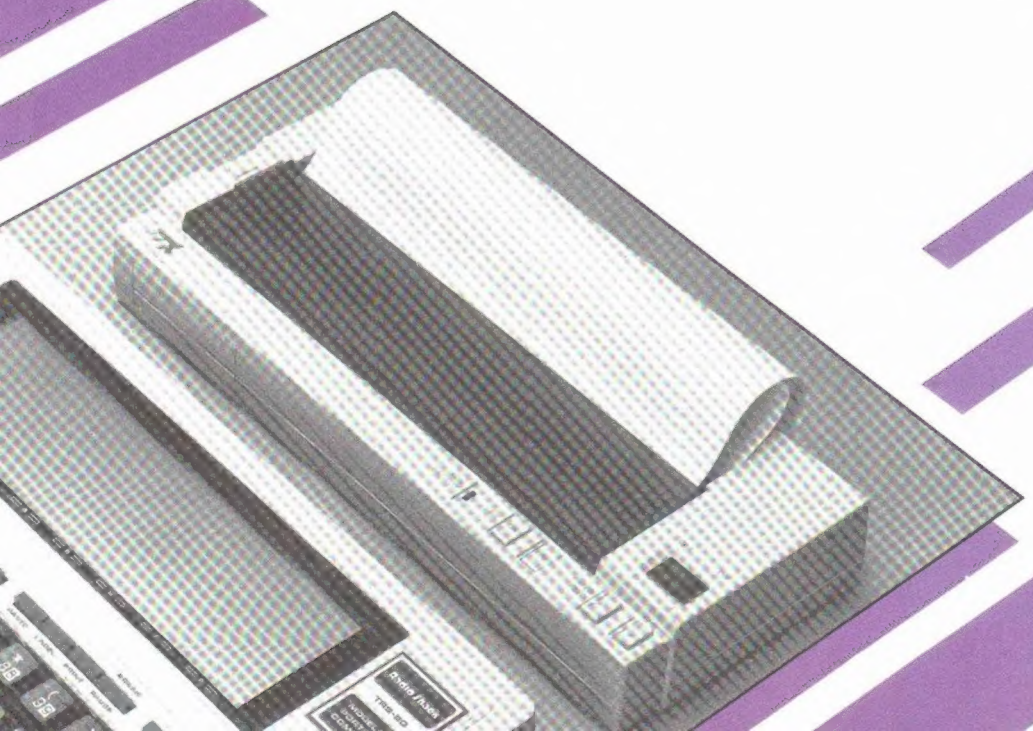

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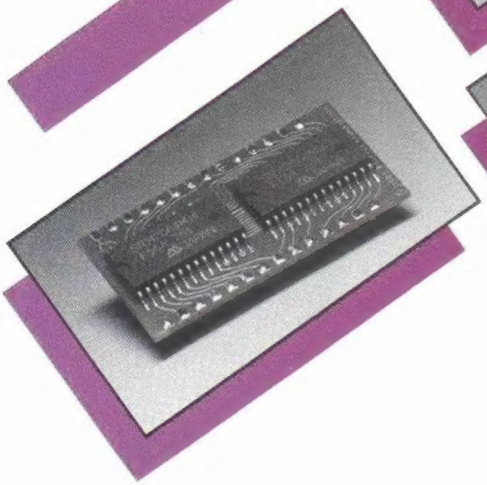

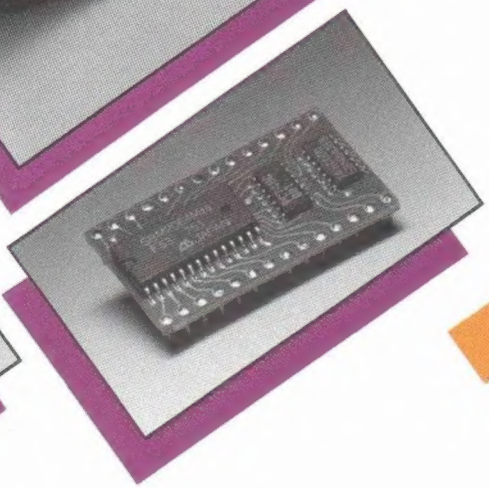

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portable 100/200/600

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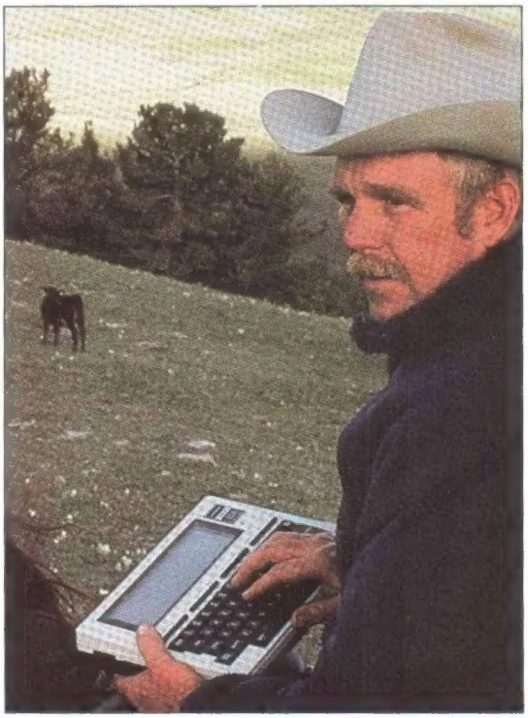

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DOWN ON THE FARM 32
From Wyoming's rangelands to Iowa's barnyards portable computers are making their mark as the farmhands of the future.

Cover Photo by Bruce McAllister

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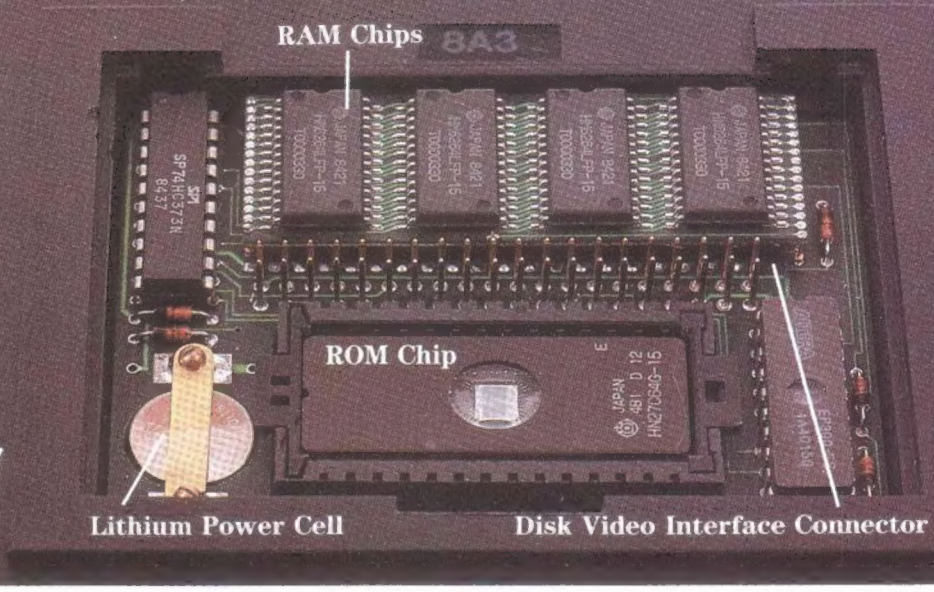
State of The Art RAM Technology



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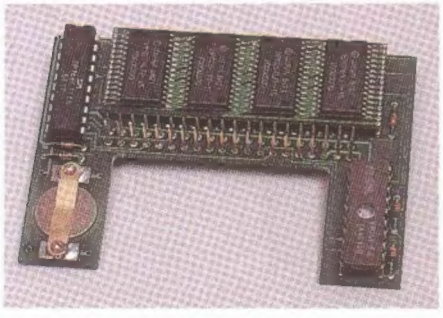

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ROM WITH A VIEW

Hats Off

A few months ago the CBS Evening News ran a special segment on farming in America. It wasn't an upbeat story. Mostly it concerned farmers down on their luck, on the brink of bankruptcy. They had borrowed and borrowed and borrowed until the banks said, "That's enough." Now they were facing foreclosure, property auctions and a questionable future.

I found it ironic that at the same time CBS's farm story was being aired, I was in the middle of editing Grant Mangold's article about portables in agriculture. It doesn't paint any rosier a picture, but it does present a more positive perspective.

I've certainly become a lot more aware of the finer points of farming since deciding to run this story. There's more to it than throwing seeds in the ground and waiting a few months. It's a business just like anything else. It not only takes hard work and perseverance but true marketing savvy.

Computers large and small are playing integral roles in farming's future — not only in what's being brought to market but at what price. For every commodity broker bidding to buy 50,000 bushels of soybeans there are 50 denim-clad farmers trying to fill that order. With computers, farmers can accurately calculate their cost of production, analyze markets and market trends and thereby sell at an optimum price.

It's heartwarming to see farmers (and ranchers) aren't standing still and letting the computer revolution pass them by. They're taking the bull by the horns and making the new technology work for them. Like the plow and combine before them, computers are making their mark as the new tool of the agricultural trade. We're glad to see portables will be a part of that future.

Credit should be given to the farm press and in particular publications like *Farm Computer News* in Des Moines, Iowa (FCN) for generating interest in emerging farm technologies. If you're a farmer or rancher, you shouldn't be without FCN. It's an excellent source of information.

It's been a couple of months since that news segment aired on television. Undoubtedly a few more farmers have succumbed to financial woes during that time. But then again a few more computers may have sprung up on kitchen tables in places like Iowa, South Dakota and Wyoming. And that's good news.

My hat's off to America's farmers. They're a hearty breed.

A CALL TO ARMS

Alan Zeichick, our technical editor and editor of the *Portable Program Review* newsletter asked me to remind you that *anyone* can send us article and program submissions. In fact, some of the best material we've published in these pages has come from our readers.

We will consider programs of any length as long as they have clear and concise instructions. Applications, utilities, spreadsheet templates — anything you feel might be of use to other Tandy portable computer owners.

Through phone calls and letters, you've made it clear that programs are important. Help us fill your needs by sharing your software with *Portable 100* and *Portable Program Review*. Thanks.

Park M. Morrison
Senior Editor

portable 100/200/600

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Calling All Peeks and Pokes

A guide to converting Model 100 programs to the Tandy 200 and vice versa.

By Greg Susong

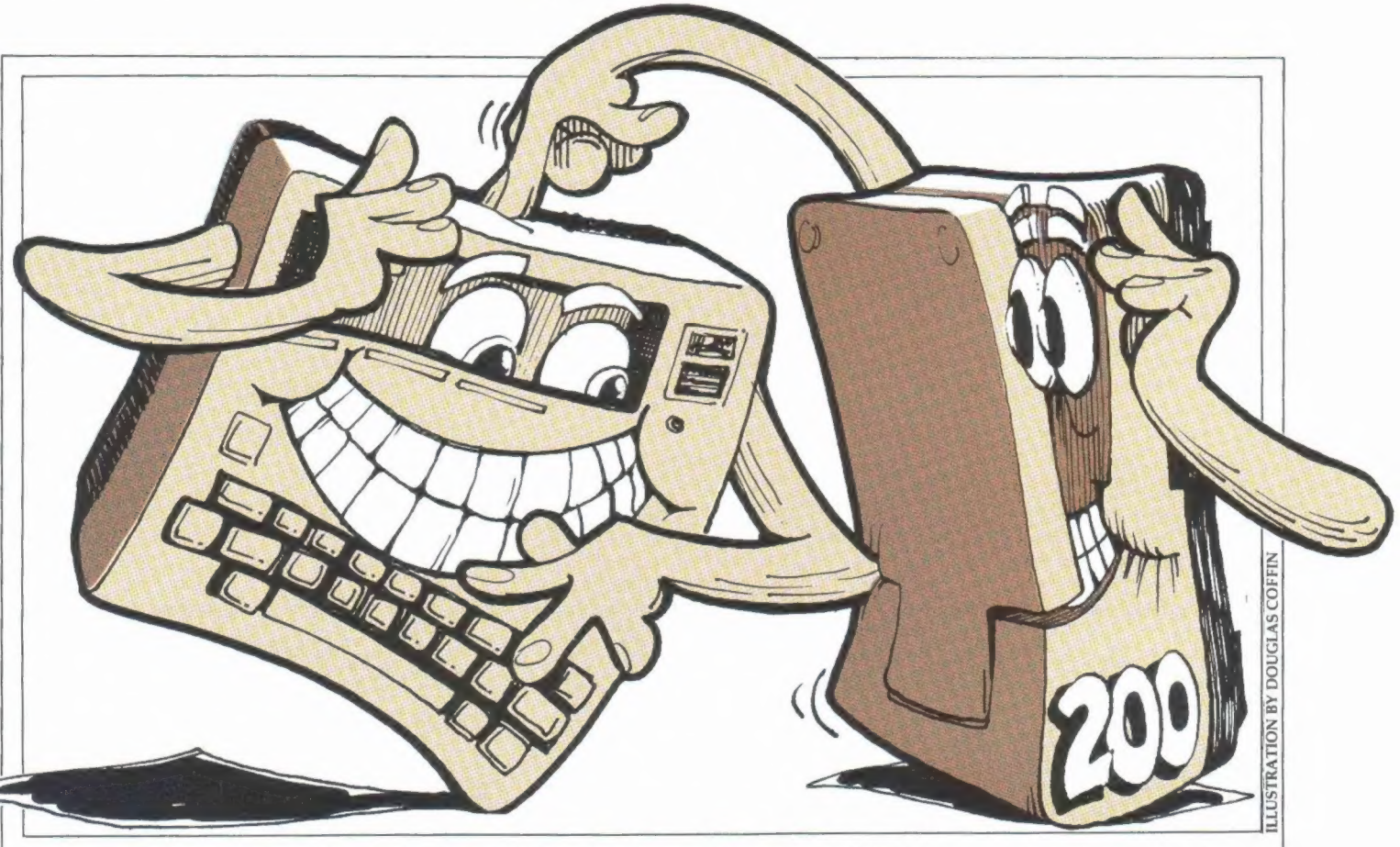

ILLUSTRATION BY DOUGLAS COFFIN

MODEL 100 TO TANDY 200 CONVERSION TABLE

MODEL 100 ADDRESS	DESCRIPTION	TANDY 200 ADDRESS
30	Print space character	30
32	Print character in the A register	32
128	Table of BASIC keywords	128
796	Table of BASIC error codes	796
1002	"Error"	1045
1009	" in "	1052
1014	"Ok"	1057
1019	"Break"	1062
1245	Display error message	1160
1576	Search for BASIC line number	1619
1606	Tokenize a BASIC line	1649
3188	"?Redo from start"	3231
3441	"Extra ignored"	3529
4072	Capitalize character pointed to by HL	4115
4073	Capitalize character in A	4116
4811	Wait for character from the keyboard	4855
5169	Power off and resume	5449

Listing continues on page 9

It's happened to all of us. You know — right in the middle of typing in a long program listing you come across a PEEK or a POKE statement. No big deal except the listing you're typing in wasn't written for the computer you're using. You've got a Tandy 200 and the program was written for the Model 100. PEEK and POKE aren't the only keywords that strike fear into the heart of someone converting a BASIC program from one computer to another. CALL, INP and OUT have a similar disheartening effect.

Most of these problems can be easily overcome when exchanging programs between the Model 100 and the Tandy 200. In most cases all it will take is replacing a POKE or PEEK address with the equivalent address in the other computer. Other times you may need to have an understanding of what the program is doing. Then you can replace the problem program lines with lines of

your own creation — ones that accomplish the same task and return the same argument to the program.

A program that comes to mind is the one provided on page 199 of the Model 100's manual. It's designed to call the Dow Jones News Retrieval Service, ask for stock quotes on specified companies, log off and save the information in a file named QUOTE.DO. As you look through the program you'll notice that lines 50, 60 and 270 have CALL statements. By checking the accompanying conversion table you can easily plug in the equivalent addresses. All's fine now, right? Well, not quite. The program still won't run until you change the communications parameters in lines 80 and 90. The 200 has three extra settings that have to be specified in the parameter string. They're the Control Code Filter, Line Feed and the Originate/Answer Switch. These parameters must be added to the parameter string or a ?NM (Bad file name) error will occur. In lines 80 and 90 change the string "MDM:7I1D" to "MDM:7I1DNN,O."

Probably the best method for making programs run on either the 100 or the 200 is to design the program so that it will make the necessary conversions

itself. For example, memory location 1 in the 100 holds the value 51. The same location in the 200 holds 171. To illustrate this example, I've chosen the LSTFIL program (*Portable 100, November 1985*). Line 170 in the program is the only line that is machine dependent. It reads:

```
170 LL=62132+J:AA=PEEK(LL)
```

The value 62132 is the location that precedes the address of the first slot available to the user in the Model 200's directory area. The equivalent address in the 100 is 63929 (not 63841 as mentioned in the article). To make this program work equally well on either machine, line 170 could be changed to:

```
170 IF PEEK(1)=171 THEN LL=62132+J
    ELSE LL=63929+J
171 AA=PEEK(LL)
```

With this alteration, it makes no difference to the user on which machine the program is used. This is far superior to forcing the user to interpret the program and change it. All he or she wants to do is use the program. (Take note programmers!)

The accompanying conversion table should make it easier for the non-programmer to convert programs from the Model 100 to the Tandy 200 and vice versa. If you're a programmer you can use this table to design programs that work on both machines without alteration.

But remember: Always make backup copies of all important files before experimenting with these CALLs, PEEKs and POKEs. One little mistake could send your data into Never Never Land!□

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Circle 26 on Reader Service Card

5232	Send character to printer-tabs unexpanded	5520	16625	Check for upper-case alphabetic character	19980
5288	Turn on cassette motor	5568	16626	Check for upper-case alphabetic character	19981
5290	Turn off cassette motor	5570	16930	Print carriage return & line feed	20286
5296	Get character from cassette & checksum	5576	16937	Beep	20293
5313	Send character to cassette & checksum	5593	16941	Home cursor	20297
6415	Read system time into buffer	6782	16945	Clear screen & home cursor	20301
6447	Read system date into buffer	6814	16949	Set system line	20308
6498	Read system day into buffer	6853	16954	Reset system line	20313
7089	Reset power down counter	9879	16959	Lock out screen scroll	20318
7102	Key list	9892	16964	Enable screen scroll	20323
7136	Print printable characters	9926	16969	Turn on cursor	20328
7774	Dump screen contents to printer	10566	16974	Turn off cursor	20333
7994	Display visible files	10794	16979	Delete current line	20338
8126	Kill a TEXT (.DO) file	10932	16984	Insert line	20343
8396	Kill a file	11052	16989	Erase to end of line	20348
8405	Search for next valid file entry	11250	17001	Turn on reverse video	20360
8420	Search for an empty file slot	11273	17006	Turn off reverse video	20365
8698	Return the length of a filename	11587	17008	Print chr$(27) and character in A	20367
8719	Create a TEXT (.DO) file	11644	17015	Position cursor to bottom left of screen	20374
8761	Insert entry into directory	11692	17020	Position cursor	20379
9581	Beep and go to main menu	13010	17061	Set and display function keys	20420
9685	"Top:"	13114	17064	Display function keys	20423
9691	"End:"	13120	17082	Erase function key display	20393
9697	"Exe:"	13126	17982	Prompt with ? & get line from keyboard	21744
9984	"Found:"	13412	17988	Get a line from the keyboard	21750
9989	"Skip:"	13419	19268	Print the character in A	23045
13417	Move memory from DE to HL increasing	16826	19285	Send char to printer-expand tabs	23060
13426	Move memory from DE to HL decreasing	16835	19467	Format filename and check validity	23242
14804	Convert value in HL and display	18187	20234	Fill block of memory with binary zeros	24001

POWER — 100 — 200

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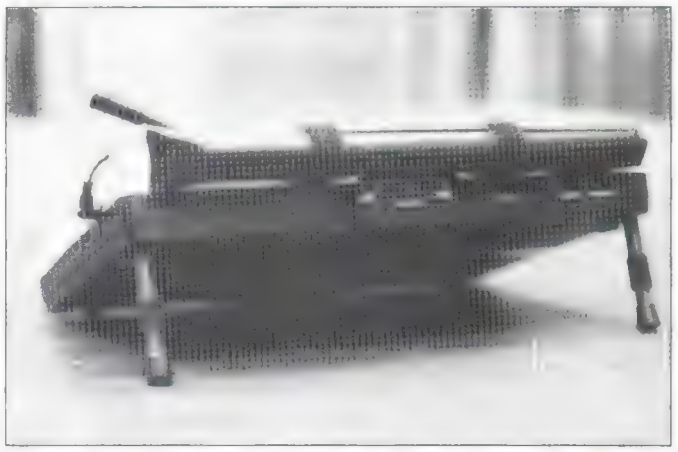

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Circle 5 on Reader Service Card

20235	Fill block of memory with any value	24002
20721	Device table	24488
20806	TELCOM entry point	24573
20900	TELCOM function key definitions - Set 1	24667
20928	TELCOM's stat routine	24695
21179	Disconnect phone line	25018
21200	Connect phone line	25040
21293	Dial phone number	25131
21514	Dial a single digit	25386
21589	TELCOM's term routine	25464
21773	Jump table when in term mode	25738
21795	F6 - (BLANK) in TELCOM's term mode	25754
22142	F1 - PREV in TELCOM's term mode	25757
21917	F4 - FULL in TELCOM's term mode	25784
21822	F5 - ECHO in TELCOM's term mode	25802
21840	F3 - UP in TELCOM's term mode	25879
21789	F2 - DOWN in TELCOM's term mode	26120
21792	F7 - in TELCOM's term mode	26306
22302	F8 - BYE in TELCOM's term mode	26331
22423	Menu entry address	26532
22985	Position cursor to print filename	27985
23058	Print time and date at top of screen	28055
23013	Place or remove cursor bar	28013
23128	Print string of characters	28150
23138	Move a block of memory	28166
23149	Compare strings	28177
23161	Clear function key definition table	28189
23164	Set function key definitions	28192
23198	Display function key table if enabled	28226
23209	Search directory for a file	28239
23267	Get a files storage address	28348
23273	"JanFebMarAprMayJunJulAugSepOctNovDec"	28306
23326	File type table	28342
23400	ADDRSS entry point	28391
23407	SCHEDL entry point	28397
23818	ADDRSS function key definitions - 1	28942
23838	ADDRSS function key definitions - 2	28968
24046	TEXT entry point	29085
23359	Blank set of function key definitions	29140
24106	TEXT function key definitions	29148
24356	Prompt for space bar	29402
27489	Insert a character into a file	33436
27501	Insert a number of spaces into a file	33451
27551	Delete characters from a file	33498
27611	Move memory block in increasing manner	33558
27622	Move memory block in decreasing manner	33569
27633	Initial directory entries	33580
27721	Entry point for BASIC	33679
27795	Copy F key table 1 to F key table 2	33747
27804	Copy F key table 2 to F key table 1	33762
27862	Cold start reset	33820
27967	Send character to line printer	33993
28013	Check RS232 queue for characters	34056
28030	Get character from RS232 queue	34073
28171	Send XON resume character	34312
28190	Send XOFF pause character	34327
28210	Send char to RS232 with XON/XOFF	34340
28277	Set baud rate for RS232	34477
28399	Detect carrier	34634
28486	Write cassette header & sync byte	34769
28507	Write character to cassette no checksum	34790
28549	Read cassette header & sync byte	34832
28714	Read character from cassette no checksum	34995
29250	Scan for keypress and return	35587
29315	Check for break characters	35661
29772	Turn on screen pixel	36214
29773	Turn off screen pixel	36215
29774	Turn on or off screen pixel	36216
29381	Make tone	35776
29756	Turn on RST 7.5 interrupt	36198
30300	Turn off and rearm RST 7.5 interrupt	36768
30306	Make a beep	36779
30278	Pulse buzzer	36809
30479	Character set	36963
31729	Keyboard matrix	38755
32428	Print bytes free message	39677
62964	Holds HIMEM value	61108
62969	RST 5.5 vector	61113
62972	RST 6.5 vector	61119
62975	RST 7.5 vector	61122
63019	Dialing method	61172
63024	F key 1 on/off flag	61181
63025	F key 2 on/off flag	61182
63026	F key 3 on/off flag	61183
63027	F key 4 on/off flag	61184
63028	F key 5 on/off flag	61185
63029	F key 6 on/off flag	61186
63010	F key 7 on/off flag	61187
63011	F key 8 on/off flag	61188
63032	Current screen in use	61189
63033	Cursor row position	61190
63034	Cursor column position	61191
63035	Number of active lines on screen	61192
63036	Screen width	61193
63037	Label line on/off flag	61194
63058	BASIC's error trap	61236
63063	Power down setting	61240
63066	TELCOM linefeed switch	61243
63067	TELCOM device	61244
63068	TELCOM word length	61245
63069	TELCOM parity	61246
63070	TELCOM stop bit	61247
63071	TELCOM XON/XOFF	61248
16 AND INP(187)	TELCOM Orig/Answ	61252
63073	CALL target address	61257
63079	Code for OUT command	61266
63082	Code for INP command	61269
63093	Output flag printer/screen	61280
63098	BASIC line number being executed	61285
63100	Start address of current BASIC program	61287
63104	End of BASIC statement marker	61291
63105	Holds tokenized BASIC line	61292
63109	Holds line from input routine	61296
63369	F1 - Table 1	61556
63385	F2 - Table 1	61572
63401	F3 - Table 1	61588
63417	F4 - Table 1	61604
63433	F5 - Table 1	61620
63449	F6 - Table 1	61636
63465	F7 - Table 1	61652
63481	F8 - Table 1	61668
63498	F1 - Table 2	61685
63514	F2 - Table 2	61701
63530	F3 - Table 2	61717
63546	F4 - Table 2	61733
63562	F5 - Table 2	61749
63578	F6 - Table 2	61765
63594	F7 - Table 2	61781
63610	F8 - Table 2	61797
63787	Day of week	61976
63785	Day of month - low digit	61977
63786	Day of month - high digit	61978

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Disk+

on Snap-In™ ROM

NOW AVAILABLE ON M-200

Try *Disk+* for 30 days. If you aren't as excited as we are, return it for a full refund.

When we designed *Disk+* we did it out of necessity. We wanted a way that we could just connect a Model 100 to our desktop computer with a cable and save files onto the desktop's disk drive. We wanted it to be so simple to use it would be self-explanatory.

Picture this. *Disk+* comes to you on a Snap-in ROM and a diskette for your desktop. You take a quarter and open the little compartment on the back of your Model 100. Then you just press the ROM into the socket. *Disk+* appears on your main menu just like a built-in.

You connect your Model 100 to your other computer using an RS232 cable (available from PCSG for $40).

You just place the *Disk+* diskette into the desktop's drive and turn on the computer. It powers up automatically and says "awaiting command" on your desktop's screen. Then you just put the widebar cursor on the Model 100 main menu on *Disk+* and press ENTER. You are shown your RAM files arranged just like the main menu.

To save a file to your other system's disk drive, you just move the widebar cursor to the file you want to save and press ENTER. It is saved instantly with no further action.

To look at the disk directory, you just press a function key on your Model 100. You see immediately the disk directory on your Model 100 screen, and it is arranged just like your Model 100's main menu.

To load a file from the diskette to your Model 100, you just move the widebar cursor to the file and press ENTER. The file is transferred to your Model 100's RAM instantly. You can press F8 and go back to the main menu, and the file you loaded from diskette is there, ready to use.

It is so nice to be able to keep your documents, programs (both BASIC and machine code) and *Lucid* spreadsheet files on the diskette, and bring them back when you need them. All files are ready to run or use with no changes or protocol by you.

If you have access to a desktop computer and don't have *Disk+*, then evidently we have done a poor job telling you about it.

All files and programs that you load or save, go over and come back exactly as they are supposed to be because of full error checking. This guaranteed integrity is really a comfort. *Disk+* is wonderful in so many other ways. For example, you can do a "save all" of all your RAM files with just a touch of a function key. That group of files is saved on the diskette under a single filename with a .SD (for subdirectory) extension. Any time you want, you can bring back all those files at once, or just one or two if you like, again with one-button ease.

Disk+ takes up no RAM. That's zero bytes either for storing the program or for operating overhead.

What really excites most *Disk+* users is text file cross compatibility. Your Model 100's text files are usable on your desktop computer, and your desktop's text files become Model 100 text files.

This means you can write something on your Model 100, and with *Disk+* transfer it instantly to your desktop and start using it right away on your bigger computer. Or the way we like to work is to type in a document on the desktop computer and then transfer it to our Model 100 with *Disk+*. Then we print out the document, beautifully formatted, using WRITE ROM.

Disk+ works with just about every micro sold, from IBM PC and its clones, to all Radio Shack computers (yes, all), to Apple II, Kaypro, Epson and most CPM. Just ask us. More than likely, your computer is supported.

Incidentally, hundreds of Model 100 owners have gone to their Radio Shack stores and bought a color computer because it is so low priced, and with *Disk+* they have an inexpensive disk drive.

And if that weren't enough, how about this: *Disk+* also provides cross-compatibility between different computers like IBM, Apple or the Model 4 using the Model 100 as the intermediary device. Quite a feature!

The snap-in ROM is really great because you can use other ROMs like *Lucid* or WRITE ROM. They snap in and out as easily as an Atari game cartridge and you never lose your files in RAM.

Anyone who ever uses *Disk+* simply can't do without it. But so many times we have had new users call us and say, "Wow! I had no idea when I ordered it that *Disk+* would be so fantastic. I just couldn't believe that I could use my desktop computer's disk drive with my Model 100 just like it is another main menu."

That's why we sell *Disk+* on a thirty-day trial. If you aren't completely satisfied, return it within thirty days for a full refund. Priced at $149.95 on Snap-in ROM. MasterCard, Visa or COD.

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PORTABLE COMPUTER SUPPORT GROUP

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PCSG provides hotline software support for the Model 100. Call us at 1-214-351-0564

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Circle 36 on Reader Service Card.

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GEnie*	**X**	**X**	**X**	**X**	**X**	**X**	**$18.00**	**none**	**$5.00**	**$5.00**
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The Source	X	X	no	X	X	X	$49.95	$10.00	$8.40	$10.80

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63789	Year - low digit	61981
63790	Year - high digit	61982
63791	Counter 150 to 1	61983
63792	Counter 12 to 1	61984
63793	Power down counter	61985
63812	ON COM GOSUB status	62004
63813	ON COM GOSUB address	62005
63815	ON TIME$ GOSUB status	62007
63816	ON TIME$ GOSUB address	62008
63818	ON KEY 1 GOSUB status	62010
63819	ON KEY 1 GOSUB address	62011
63821	ON KEY 2 GOSUB status	62013
63822	ON KEY 2 GOSUB address	62014
63824	ON KEY 3 GOSUB status	62016
63825	ON KEY 3 GOSUB address	62017
63827	ON KEY 4 GOSUB status	62019
63828	ON KEY 4 GOSUB address	62020
63830	ON KEY 5 GOSUB status	62022
63831	ON KEY 5 GOSUB address	62023
63833	ON KEY 6 GOSUB status	62025
63834	ON KEY 6 GOSUB address	62026
63836	ON KEY 7 GOSUB status	62028
63837	ON KEY 7 GOSUB address	62029
63839	ON KEY 8 GOSUB status	62031
63840	ON KEY 8 GOSUB address	62032
63842	Start of directory	62034
63842	BASIC's attribute byte	62034
63843	BASIC's start address	62035
63845	BASIC's filename storage area	62037
63853	TEXT's attribute byte	62045
63854	TEXT's start address	62046
63856	TEXT's filename storage area	62048
63864	TELCOM's attribute byte	62056
63865	TELCOM's start address	62057
63867	TELCOM's filename storage area	62059
63875	ADDRSS's attribute byte	62067
63876	ADDRSS's start address	62068
63878	ADDRSS's filename storage area	62070
63886	SCHEDL's attribute byte	62078
63887	SCHEDL's start address	62079
63889	SCHEDL's filename storage area	62081
63897	Unsaved BASIC file's attribute byte	62100
63898	Unsaved BASIC file's start address	62101
63908	Paste buffer's attribute byte	62111
63909	Paste buffer's start address	62112
63919	BASIC's edit mode attribute byte	62122
63920	BASIC's edit mode start address	62123
63922	BASIC's edit mode filename storage area	62125
63930	User file 1 attribute byte	62133
63931	User file 1 start address	62134
63933	User file 1 filename storage area	62136
63941	User File 2 attribute byte	62144
63942	User file 2 start address	62145
63944	User file 2 filename storage area	62147
63952	User file 3 attribute byte	62155
63953	User file 3 start address	62156
63955	User file 3 filename storage area	62158
63963	User file 4 attribute byte	62166
63964	User file 4 start address	62167
63962	User file 4 filename storage area	62169
63974	User file 5 attribute byte	62177
63975	User file 5 start address	62178
63977	User file 5 filename storage area	62180
63985	User file 6 attribute byte	62188
63986	User file 6 start address	62189
63988	User file 6 filename storage area	62191
63996	User file 7 attribute byte	62199
63997	User file 7 start address	62200
63999	User file 7 filename storage area	62202
64007	User file 8 attribute byte	62210
64008	User file 8 start address	62211
64010	User file 8 filename storage area	62213
64018	User file 9 attribute byte	62221
64019	User file 9 start address	62222
64021	User file 9 filename storage area	62224
64029	User file 10 attribute byte	62232
64030	User file 10 start address	62233
64032	User file 10 filename storage area	62235
64040	User file 11 attribute byte	62243
64041	User file 11 start address	62244
64043	User file 11 filename storage area	62246
64051	User file 12 attribute byte	62254
64052	User file 12 start address	62255
64054	User file 12 filename storage area	62257
64062	User file 13 attribute byte	62265
64063	User file 13 start address	62266
64065	User file 13 filename storage area	62268
64073	User file 14 attribute byte	62276
64074	User file 14 start address	62277
64076	User file 14 filename storage area	62279
64084	User file 15 attribute byte	62287
64085	User file 15 start address	62288
64087	User file 15 filename storage area	62290
64095	User file 16 attribute byte	62298
64096	User file 16 start address	62299
64098	User file 16 filename storage area	62301
64106	User file 17 attribute byte	62309
64107	User file 17 start address	62310
64109	User file 17 filename storage area	62312
64117	User file 18 attribute byte	62320
64118	User file 18 start address	62321
64120	User file 18 filename storage area	62323
64128	User file 19 attribute byte	62331
64129	User file 19 start address	62332
64131	User file 19 filename storage area	62334
64139	End of directory flag	62639
63898	Directory address current BASIC program	62651
64175	IPL string	62685
64190	Stack pointer after power off	62700
64201	Holds RST 7 offset into jump table	62711
64218	Start of RST 7 branch table	62727
64218	CLEAR vector	62727
64268	F6 in TELCOM's TERM mode vector	62783
64270	F7 in TELCOM's TERM mode vector	62785
64274	F8 in TEXT and BASIC's edit mode vector	62789
64276	Width statement vector	62791
64415	BASIC line # where error occurred	63058
64417	Most recently listed/entered line #	63060
64419	Address where error occurred	63062
64421	Address of ON ERROR GOTO line	63064
64426	Line number where break occurred	63069
64434	Points to start of variable storage	63077
64436	Points to start of array table	63079
64438	Holds location of first free byte in RAM	63081
64642	MAXFILES value	63285
64659	File name #1	63302
64668	File name #2	63311
65024	First byte of LCD image area	64048
65343	Last byte of LCD image area	64687
65348	Sound on/off flag	64756
65450	Number of characters in keyboard queue	64798
65451	Keyboard queue	64799

The Missing Link

So you want to use your Tandy Portable Disk Drive with your desktop. Impossible? Not any more. Traveling Software has introduced LAPDOS, a disk management system that lets you run your 3.5-inch disk drive on an IBM PC, XT, AT or compatible computer.

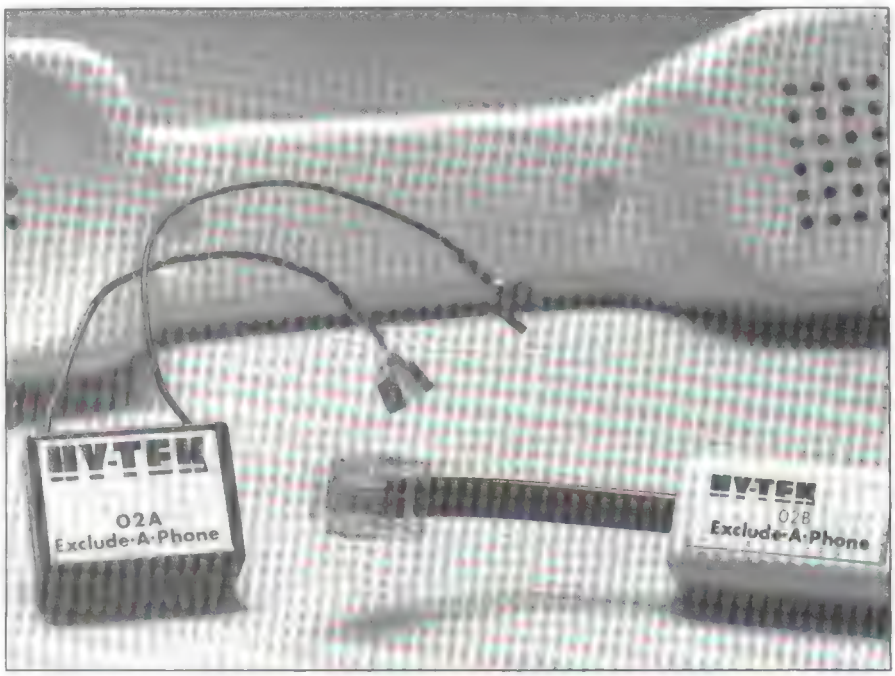
The package includes a 5.25-inch disk and cable converter. The converter connects to the portable disk drive cable and to the RS-232 port on your desktop. LAPDOS displays disk contents of your portable disk drive and MS-DOS disk on the same screen.

Traveling Software's LAPDOS features 10 function key commands including:

- View — for viewing contents of files;
- Copy — copies files from portable disk drive to MS-DOS disk, or vice versa;
- Mcopy — allows standard MS-DOS wildcard copy options to be used;
- Rname — renames files;
- Erase — erases files;
- Xchg — exchanges file formats.

The LAPDOS package (including cable convertor) is priced at $89.85. Contact Traveling Software Inc., 11050 Fifth Avenue NE, Seattle, WA 98125, (206) 367-8090.

Circle No. 81



Phone Isolation

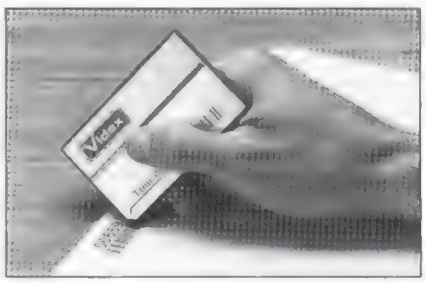
Tired of having someone pick up an extension phone and ruin your computer transmission? You can prevent this by installing Hy-Tek's Exclude-A-Phone.

The device's sole purpose is to block out an extension phone from interfering when that line is already in use. If your computer is online and someone picks up an extension, their phone will be dead.

Installation is as simple as plugging in a phone cord. No batteries or AC outlets are required since Exclude-A-Phone operates of the phone's electric power.

Price of Exclude-A-Phone is $23.95. Direct sales and technical support is provided by R.K. Burtchaell Company, 516 SE Morrison, Suite 201, Portland, OR 97214, (800) 342-5752 or (503) 236-5775.

Circle No. 85



Bar Code Card

The small get smaller. Timewand from Videx, Inc. is a portable bar code reader. Roughly the size of a credit card — and alarmingly similar in appearance — it fits easily in a shirt or coat pocket. Its rechargeable battery will power it for three days. In addition, it comes with up to 16 kilobytes (K) of random access memory (RAM) that capable of storing over 1750 bar code scans.

As the card passes over a bar code, the code and precise time is recorded. The card can then be inserted into the Timewand Recharger that also transfers data to a computer.

Timewand is compatible with a number of existing software packages including Jazz, Multiplan, dBase III and Lotus 123. Videx offers several business packages for the Model 100 and Tandy 200.

Timewand comes in three sizes: 2K, 8K and 16K. They sell for $198, $228 and $248 respectively. The Timewand Recharger is $149. Software for the Model 100 or Tandy 200 is $100. All are available from your local computer store or directly from Videx Inc., Corvallis, OR 97330, (503) 758-0521.

Circle No. 84

Slide Labeler

Trac Industries has introduced Slidetypers, a line of alphanumeric dot-matrix imprinters for 35mm slide mounts. The standard unit consists of an imprinter and NEC 8201 portable compu-

Text continues on page 46

Changes your Model 100 into a totally different computer with capability you never thought possible.

Lucid™ on Snap-In™ ROM

Infoworld rated Lucid's performance "excellent"

NOW AVAILABLE ON M-200

PCSG says "Satisfaction Guaranteed or your money back within 30 days!"

LUCID© is here now. It is on a ROM cartridge that snaps into the compartment on the back of your Model 100. It takes no memory to load and no memory for operating overhead. That means you have the full 29.6k bytes free to store your data.

First, LUCID© is memory conserving. It will let you build a large spreadsheet – 255 row by 126 column capacity. You build huge spreadsheets in your Model 100's RAM that could consume 80 to 100K on a desktop computer.

Secondly, LUCID© is fast. LUCID© is so rapid, a 36 column corporate financial statement took less than 4 seconds to calculate.

Thirdly, LUCID© has features you won't find in most other spreadsheets. For example, when you type a label (text) it will cross column boundaries; in other words when you type a label or title it will appear as you type it irrespective of column or width. LUCID© also allows you to set column widths individually, and of course LUCID© has insert row and insert columns, as well as other standard features. LUCID© even lets your formulas refer to cells in other spreadsheet files.

Further, LUCID© has what no other spreadsheet has: Cut, Copy, and Paste. It uses the same keys as Cut and Paste in TEXT, but here's the difference: it takes all the formulas with it when you paste and they all automatically recalculate with the entire sheet.

And here is what is really amazing. You can copy or cut from one spreadsheet and paste into another spreadsheet or even a TEXT file.

LUCID©supports all BASIC math functions as well as Log, sine, cosine, tangent, exponentiation and other sophisticated math functions.

LUCID© has so many features that you will say "this is what I need in a spreadsheet", such as automatic prompting of an incorrectly typed-in formula showing just where the mistake was made.

LUCID© has expanded "go to" functions that remember and produce a windowing capability.

But perhaps most remarkable is that LUCID© is not only a spreadsheet but a program generator as well. First, LUCID© lets you protect all cells against entry or change, and then unprotect just the cells you want for someone else to use as input fields.

LUCID© will not only process values, but text input as well so that the facts other than numbers can be responded to. LUCID© has the ability for you to refer in a formula to cells containing words. This feature combines with the capacity of doing "if then" statements that work by doing table lookups against even massive X/Y charts of text or numerical information. You can produce a program that responds to inputs with no programming knowledge whatsoever.

You can prepare a report section in your spreadsheet with instructions to your user for printout, and they can produce a personalized printout that responds to their input. All your formulas and tables that did the calculations and provided the facts are invisible to that user. LUCID© is useful for doctors for patient questionnaires, trouble-shooting technicians, purchase clerks, people doing job quotes, stores for customer workups, insurance agents and anybody who needs to process specific facts and numbers to produce a report based on those responses.

LUCID© comes with a manual that explains not only the characteristics of LUCID©, but will train you how to use a spreadsheet even if you have never seen one before. You are shown how to do budgets, forecasts, breakeven analysis amortizations and many other types of personal and business reports and calculations.

User friendly is such an over-used term in this industry, but a typical comment has been "I have never seen a spreadsheet that does so much, and yet LUCID© is so much easier and faster to use."

LUCID© is a result of a most exhaustive developmental effort in which PCSG's objective was to develop a spreadsheet that was better than the state-of-the-art. We are so pleased because LUCID© provides for the Model 100 spreadsheet capability you cannot equal on a desktop computer.

LUCID© is, in our opinion and that of those who have examined it, a breakthrough. We sell it on a 30 day trial. If you are not completely satisfied, return it within 30 days for a full refund. Priced at $99. on snap-in ROM. MasterCard, Visa or COD.

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First with software for the Model 100

PORTABLE COMPUTER SUPPORT GROUP

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Dallas, Texas 75229

Circle 35 on Reader Service Card

With Power to Spare

Acroatix adds some punch to Tandy's disk drive. What two people think.

BY PAUL J. PERRY

Powr-Disk from Acroatix is best thought of as an extension to the Model 100's BASIC interpreter which allows access to the Tandy Portable Disk Drive (PDD). With the program installed, you enhance the file manipulation capabilities of Model 100 BASIC to beyond what Tandy expected the drive to be used for.

Powr-Disk comes on diskette and requires that Tandy's FLOPPY.CO be resident in memory to be loaded. It uses about 2 kilobytes (K) of memory to execute. It can be relocated, making it easy to use with other machine language programs.

There are three sections to Powr-Disk: TEXT enhancements, BASIC extensions and the MENU.BA program. The first two are part of the main Powr-Disk program. MENU.BA is a separate utility program which simplifies transfers to and from the disk drive.

One of the more significant features of Powr-Disk is the capability to save to or load from the disk drive while in TEXT. With a file displayed, simply press either F2 or F3. When the save or load prompt is diplayed enter the file name preceded by a colon (or 0:). Hit Enter and off you go. It's an easy procedure.

Powr-Disk's BASIC extensions can be grouped by type: enhanced commands, modified commands and one new command.

Enhanced commands work exactly like their BASIC counterparts except that they operate on a disk file. These include the file manipulation commands LOAD, KILL, MERGE, RUN, RUNM and SAVE. As before, these require that you specify the disk drive with either a 0: or : prefix.

Enhanced but functionally unchanged are the following manipulation commands: OPEN, CLOSEn, EOF(n), INMPUT#, INPUT$(n,#), LINEINPUT#, PRINT# and PRINT #USING. OPEN requires a prefix. The others in the list require that a file be open. The CLOSE command behaves as always.

The modified commands are LOADM and SAVEM. Besides supporting their usual functions, both can be used to transfer .BA and .DO files directly between computer and disk drive. The usual functions are supported with conventional syntax. The new functions are implemented with slightly modified versions of the commands. The manual was a little vague on how to use the modified commands but they were not hard to figure out.

LFILES is a new command that prints a disk directory to screen. It displays seven files at a time with a byte count. The last item it displays is "sectors free." This is a new way to report free memory. LFILESTO dumps the same information to a printer when specifying "LPT:" or to a .DO file when specifying a file name. These two versions of the command do not prompt the user. LFILESMENU resets RS232 parameters and returns the user to the main menu. LFILESOF unhooks the program and frees up the memory it occupied.

Text continues on page 44

Powr-Disk
Software enhancement for Tandy Disk Drive
Acroatix Inc.
P.O. Box 273
Wilmington, MA 01887
(800) 225-5800 or
(617) 658-5550
Circle No. 151

BY MARK SCHORR

Until the compact disk ROM arrives, the Tandy Portable Disk Drive is it for me. It's compact, durable and can store a reasonable amount (100 kilobytes) of information. However, as the reviewers of the Tandy package noted (*Portable 100*, November 1985) the software utilities supplied with the drive leave something to be desired.

As expected, it didn't take long for someone to come out with some software that enhances the portable disk drive's (PDD) operating system. Powr-Disk from Acroatix blends beautifully with the original functionality and power of the Model 100 and adds some much needed features to the PDD.

To validate Acroatix's claims, I packed up my Model 100, Tandy disk drive, an extra power supply, a copy of Powr-Disk and headed off for a weekend in Chicago. By the end of my trip I was so pleased with the new software that I was thinking up new uses for my disk drive.

When activated, Powr-Disk occupies 2 kilobytes (K) of random access memory (RAM). The accompanying file management utility, MENU.BA, takes up another 3.5K. That program is worth the price of the software to me. But more on that later.

Another utility, RELO.BA, is thoughtfully provided for relocating machine language programs that might conflict with FLOPPY.CO or POWR-D.CO.

The most useful feature that Powr-Disk has is the ability to save and load files directly from TEXT. Simply use F2 to save and F3 to load files. You must identify disk files with "0:" or just a colon (:).

One distinct advantage of this is the capability of loading a file from disk and pasting it where the cursor is located.

A minor annoyance, however, is that when saving a file to a new filename there's no warning that you may be overwriting an existing file.

Another feature of Powr-Disk is direct access to the disk using BASIC commands. The Powr-Disk enhancements make the disk drive surpass the level of a cassette recorder. Some of these important features are:

- Text files stored on disk can be opened and appended to. This means you can use a floppy disk to maintain large files such as a mailing list.
- The LOADM command supports a ",F" extension that allows you to load .BA, .CO, .DO files directly from disk into RAM.
- The SAVEM command (without the three numerical arguments) does just the reverse and lets you save those same files directly from RAM to disk.
- The KILL command removes files from disk.

I tested these enhancements by modifying a little four-line mailing list program and it worked like a charm. In fact, all of the programs I had saved for cassette could be updated

Text continues on page 45

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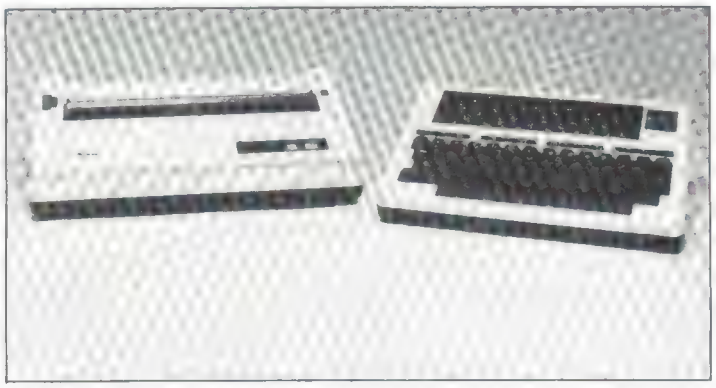
Five reasons to but the Axonix ThinWrite 80 BATTERY Powered Printer:



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WRITE ROM is the definitive word processing extension for the Model 100. PCSG produced the first text formatter for the Model 100, now sold by Radio Shack as Scripsit 100. Now, 18 months later, PSCG introduced WRITE ROM. Those who have experienced it say WRITE ROM literally doubles the power of the Model 100.

WRITE ROM — as its name implies — is on a snap-in ROM. You simply open the little compartment on the back of the Model 100 with a quarter and press WRITE ROM in. It's as easy as an Atari game cartridge. You can use other ROM programs like Lucid whenever you wish.

WRITE ROM lets you do every formatting function you'd expect, like setting margins, centering, right justifying and creating headers and footers. But it does them under function key control.

WRITE ROM remembers your favorite format settings so you can print a document without any setup, but you can change any formatting or printing parameter instantly with a function key.

WRITE ROM's "pixel mapping" feature shows you an instant picture on the screen of how your printout will look on paper.

In all there are 64 separate features and functions you can do with WRITE ROM, and some of these features are truly breakthroughs for the Model 100.

First, WRITE ROM lets you do search and replace. Any word or phrase in a document can be searched for and replaced with any other phrase where the search words appear.

Second, WRITE ROM lets you send any text (formatted or not) to any other computer over the phone with just a function key. What's more, it dials and handles sign-on and sign-off protocol automatically.

Third, WRITE ROM has a wonderful feature called Library that lets you record favorite phrases, words or commonly used expressions (often called boilerplate).

Any place you wish Library text to appear you just type a code. WRITE ROM automatically inserts the text just like a Xerox Memory Writer. Picture what you can do with that kind of capability.

WRITE ROM is blindingly fast. No one can claim faster operation. Because it is on ROM it uses virtually none of your precious RAM. It works with any printer, serial or parallel. You can make a duplicate copy of a document file under a new filename. Rename or delete (kill) any RAM file with function key ease.

This description only scratches the surface of this amazingly powerful piece of software. Dot commands allow control of such things as margins, centering, line spacing and other changes in the middle of a document. Most are WordStar™ compatible.

A mailmerge feature allows you to send the same document to every name on your mailing list, personalized for each recipient.

WRITE ROM enables you to do underlining, boldface and correspondence mode as well as any other font feature like superscripts that your printer supports, in a way that many users say "is worth the price of the program."

To underline you don't have to remember a complicated printer code. You just type CODE u, and to stop underline, CODE u again. The CODE key is to the right of your spacebar. Boldface? CODE b to start and stop. Easy to remember and do. Five different printer features of your choice.

We couldn't list all the features here. For example, you can select not just double space but triple or any other. You can use your TAB key in a document. WRITE ROM allows you to undent. This means you can have paragraphs with a first line projecting to the left of the rest of the paragraph. WRITE ROM has a feature unique for any word processor on any computer. It's called FORM. FORM is an interactive mechanism that lets you create screen prompts so that you or someone else can answer them to fill out forms or questionnaires.

With FORM, any place that you had previously typed a GRAPH T and a prompt in a document, WRITE ROM will stop and show you that prompt on the screen. You can type in directly on the screen and when you press F8 you see the next prompt. It goes to a printer or a RAM file.

Think how you can use FORM. A doctor or nurse could use it for a patient's history with each question appearing on the screen. An insurance salesman could use it for his entire questionnaire. You could construct a series of prompts to answer correspondence, typing the answers, even using Library codes. This feature lets you answer letters in rapid-fire fashion, each with personalized or standard responses.

Before WRITE ROM you had to be a programmer to create a series of prompts. Now it's as simple as GRAPH T.

PSCG makes the claim that WRITE ROM is the easiest, fastest and most feature-rich formatter for the Model 100. We're happy to offer WRITE ROM because it expands the 100 to a dimension of text processing you cannot equal on even larger computers.

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I Bug To Differ

Gary Simons is only partly correct in stating that the PRINT# command in the Microsoft BASIC dialects of the Kyocera lap portables terminates each string with a carriage return and a line feed ("Bugs and Secret Features of Model 100 BASIC, *Portable 100,* December 1985).

On the NEC PC8201A, at least, the command appends a carriage return and line feed to each string only if it isn't followed by a semicolon, much like the PRINT or LPRINT statement. This feature of the command is undocumented in the PC8201A's BASIC manual, which is understandable since the manual contains no explanation of the command at all.

This feature can be used in programs processing text files by testing the length of the strings returned by LINE INPUT#, appending CHR$(13) and CHR$(10) to strings less than 255 characters long, and outputting the strings using a PRINT# statement followed by a semicolon. The enclosed listing of S+R.BA, a search and replace utility, provides an example.

Robert Bell
Asbury, NJ

MORE ON BUGS

I enjoyed the article "Bugs and Secret Features of Model 100 BASIC" (*Portable 100, December 1985*). After wasting a whole day trying to debug a data communications problem, that article pointed me towards the MAXFILES command. MAXFILES was not only doing an undocumented CLEAR, but clearing some very important memory locations such as ON ERROR interrupt. This isn't a welcome or user-friendly feature.

Another bug that I found while on this same program is that if the sending device fails, INPUT# on the RS-232 port causes the Model 100 to hang until the Break key is pressed. The ON TIME$ interrupt won't work here, so I had to force the ON ERROR routine to trap the INPUT# line number when the system sees the Break key. What a kluge this turned out to be. But guess what?

With yet another hassle (not a bug

Robert Bell's search and replace utility showing the use of the PRINT# command followed by a semicolon.

```
10  SCREEN,0
   :FILES
   :CLEAR 1000
   :MAXFILES=2
   :DEFSTR A-O
   :DEFINT P-Z
   :E=CHR$(27)
   :PRINT E "V"
   :ON ERROR GOTO 250
20  LOCATE 5,7
   :LINE INPUT "Enter file name: ";F
   :CLS
30  LOCATE 5,3
   :LINE INPUT "Search string: "; G
40  LOCATE 5,5
   :LINE INPUT "Replace with: "; H
50  LOCATE 5,7
   :PRINT "Replace all (Y/[N])?";
60  L=INKEY$
   :IF L="" GOTO 60 ELSE CLS
70  U=LEN(G)
   :V=LEN(H)
   :IF U=V THEN I=G
   :J=H
80  IF U<V THEN I=G+STRING$(V-U,32)
   :J=H
90  IF U>V THEN I=G
   :J=H+STRING$(U-V,32)
100 O=LEFT$(F,5)+"+.DO"
   :OPEN F FOR INPUT AS 1
   :OPEN O FOR OUTPUT AS 1
110 IF EOF(1) GOTO 250
120 LINE INPUT #1, A
   :P=1
   :S=LEN(A)
130 IF S>200 THEN B=RIGHT$(A,S-200)
   :A=LEFT$(A,200)
140 IF S<255 THEN B=B+CHR$(13)+CHR$(10)
150 Q=INSTR(P,A,G)
   :IF Q=0 GOTO 240
160 C=LEFT$(A,Q-1)
```

Get Organized

The writing is on the electronic wall! If you've watched Compuserve's bulletin board for Model 100 users, you've seen these comments about TMPC, a program to manage "The Most Precious Commodity:"

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— Frank Rytell

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— Tim Peters

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— Greg Sandow

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```
    :D=MID$(A,Q+U)
    :M=""
    :IF L="Y" OR L="y" THEN LOCATE 15,5
    :PRINT "Working . . ."
    :GOTO 230
170 LOCATE 0,0
    :PRINT C+E "p" I+E, "q" D
    :FOR T=1 TO 750
    :NEXT
180 LOCATE 0,0
    :PRINT C+E "p" J+E "q" D
190 LOCATE 15,7
    :PRINT "Replace (Y/[N])?";
200 M=INKEY$
    :IF M="" GOTO 200 ELSE CLS
210 IF M="Y" OR M="y" GOTO 230
220 A=C+G+D
    :P=Q+U
    :GOTO 150
230 A=C+H+D
    :P=Q+V
    :GOTO 150
240 PRINT #2,A;
    :IF B<>"" THEN A=B
    :B=""
    :GOTO 150 ELSE 110
250 CLOSE
    :CLEAR 10
    :MENU
```

since it is implied on page 162 of the manual), the ON ERROR interrupt only works once if you don't terminate its routine with RESUME. You can't GOTO out of it and expect your next error to be trapped by your routine. Your routine must end with a RESUME so the system can restore the ON ERROR interrupt properly.

James R. Avoli
Pittsburg, PA

PRICE SENSITIVE

Just over a year ago Peter Stanwyck wrote an article about the shortcomings of the Model 100 as a word processor. He said that the 100 didn't have "all the features" of a desktop system.

I came to the beloved 100's rescue by writing and explaining that anyone who buys a portable isn't concerned with "all that fancy stuff" because it's designed for raw input and does a fine job of it. Aftermarket text formatters give the 100 monospaced justification, variable margins and the ability to change line spacing within a document.

Enter the Model 600. It's true Tandy improved the 100's text formatting capabilities in the 200. But the 600? Now that's formatting. One can have hanging indentations, change line spacing, toggle right justification on and off and see it all on the screen to boot.

So why am I writing this time? Simple. The Model 600 is the third generation laptop from Tandy. If it sold for $500 or $800 I could see making sacrifices. But at $1599 they *should* include the kitchen sink.

Here's why: The Model 600 will get quite a bit of use as a word processor due to its formatting capabilities. Why did Tandy go to all that effort of putting Microsoft's Word in ROM without the ability to underline and boldface with the owner's particular printer? You can't embed a CHR$(27) into the text because Word uses the Esc key to bring up the status line. Actually, I can underline so long as I use a Tandy printer because the command is CHR$(15) to start and CHR$(14) to stop. However, other fonts like boldface, italics, etc. require a CHR$(27).

Between the ability to embed control

codes in text and third party formatters, I can do more on my Model 100. Can anyone out there enhance the 600's Word — without introducing a totally new program — that will give us advanced formatting capabilities?

I'm afraid I can't compromise for that much money. So Peter, if you're listening, I'm on your side this time. Tandy's asking too much for what you get. Especially when they're boasting "desktop power" in their advertisements. Maybe I want too much from my portable. I'm interested in how other Tandy watchers feel.

Stan Yedlowski
Mt. Laurel, NJ

You seem to be ignoring the fact that standard with the 600 is 32 kilobytes (K) of memory, a built-in 360K capacity 3.5 inch disk drive, an 80-character by 16-line display in addition to some pretty sophisticated built-in applications. Granted the 600 has its limitations but try pricing these features separately and tack them on to the cost of a Model 100 or Tandy 200. You'll find that $1599 really isn't that bad a deal.

By the way, a review of Microsoft's Word on the Model 600 will appear in our June 1986 issue.

—Ed.

TO ERR IS HUMAN

Three lines were inadvertently omitted from the Logo listing in our January issue. They are:

```
6620 R=R+NO:GOTO 6800:REM adunits
6630 CLS:X=0:Y=0:GOTO 6800:REM clear screen and center
6650 GOSUB 9500:GOTO 6800:REM end
```

We apologize for the inco:wenience.

* * * *

Due to a renumbering snafu, line 1550 in "Datebook for the Disorganized, Chapter Two"(March, 1986) should read:

```
1550 ON KEY GOSUB 1570, 1600, 1750, 1720, 3270, 1990
```

DVORAK SEARCH

For several weeks I've been looking unsuccessfully for a program to convert a Model 100 standard QWERTY keyboard to a Dvorak keyboard. Perhaps you know whether such a program exists and how I might obtain it?

Rick Archer
Fairfield, IA

To our knowledge there's no such program commercially available. However, we're working on publishing a similar program in an upcoming issue — so stay tuned.

— Ed.

ANSWER ME THIS

Has anyone come up with a circuit to make the 100 into an auto-answer modem? The circuitry would be minimal and I wondered if I should pursue it or if it has already been invented. Any help would be appreciated.

Ambrose Barry
Las Cruces, NM

For a circuit diagram of a ring-detect modification to the direct-connect modem cable, take a look at Ring Detection *in the February 1986 issue of Portable 100, page 64.*

— Ed.

WHAT'S AVAILABLE

Back issues of Portable 100 are available to readers within the continental United States only. Price, which includes first class postage and handling, is $6 per copy for the first ten copies and $5 for every copy thereafter.

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Circle 44 on Reader Service Card

That Old Classroom Classic

Hangman for the Tandy 200.

By Cy Callaghan

Now that you've learned to reduce every word and phrase in the English language to six letters in order to name your files, you're probably looking for something new and exciting to do with words on your Tandy 200. The expanded screen of the 200 has the potential to be a great game board. But alas, where are the games?

WHAT ARE YOU DOING IN THERE

HANGMN.BA grew out of an experiment in BASIC to learn how to handle screen commands. As you'll see, the final state of the program's logo looks something like the top of a hangman's post. That's when the thought occured to put hangman — the old classroom-classic — into the computer.

An experienced programmer once told me the toughest part about writing a successful game (as opposed to other programs) is that no one plays a game they don't like. I haven't met anyone who hasn't liked Hangman.

As a quick refresher, the object of Hangman is to guess your opponent's word, one letter at a time before getting hanged. The game starts out with a blank hanging post. With each incorrect letter you choose, parts of a body are added to the hanging post until either you complete the word or your opponent completes your body. If the latter happens, you've lost the game.

The first part of the program is responsible for the opening graphics. LINE and box commands are used with a delay subroutine located at line 1200. Line 1170 starts the game. First there is a subroutine located at line 1300 that draws the hanging post. Simple LINE commands make the boxes.

At Line 1180 the "secret" word is entered and reviewed for length and displayed as a series of dashes. The variables are reset to 0 to clear any previous game.

GUESSING THE LETTER

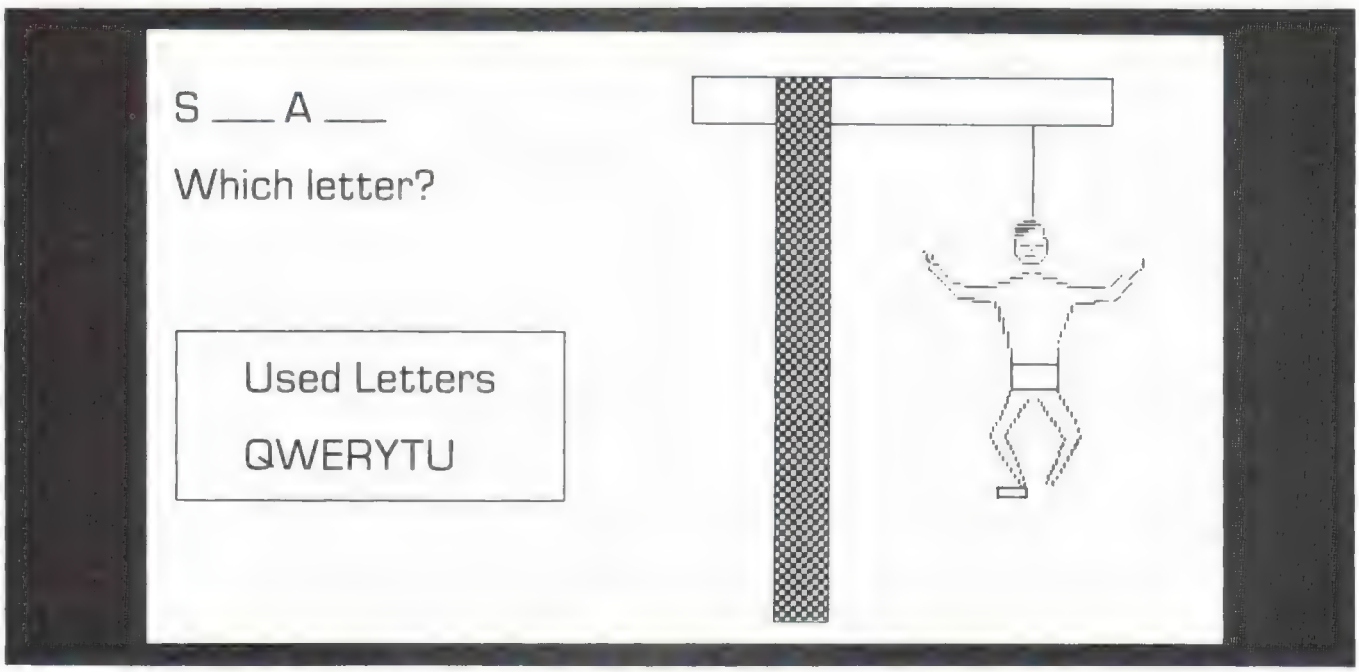
Lines 1340 to 1420 were created to determine if the letter guessed is in the word. If it is, line 1450 determines at which position it appears. That position is then assigned to the string expression LO. An IF/THEN command at 1470 is used to print the letter at the correct place. The expression LO +79 yields the correct location to print the letter.

A problem occured when a letter appeared more than once in the secret word. This was solved by the string search at line 1490. It takes the first location of the letter and conducts a new search from that point on. If it finds the letter again, it returns to the IF/THEN statement carrying the new position. Consequently, if you guess a letter that appears more than once in the word that letter is put in wherever it appears.

As it turns out this has the pleasant effect of making longer words less difficult to guess. A word can be up to 20 letters (for you entymologists out there).

If the letter guessed isn't in the word then the variable LO equals zero and a routine starting at line 1540 does many

Text continues on page 47



The Hangman screen on the Tandy 200. With each incorrect letter you choose, parts of a body are added to the hanging post until either you complete the word or your opponent completes your body.

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Includes a library of six powerful programs

Uses the main menu concept. You see the disk directory instantly, arranged on your M-100 screen like your main menu. Just move the widebar cursor and transfer files with a function key. You can run a file directly from the diskette with the ENTER key. Uses 3½" microfloppy diskettes that have a rigid plastic casing and a metal core. They're tough and nonflexible. You can carry several in a shirt pocket without damage. There's 358K on a diskette. Ten of these in your briefcase and you've got 3½ megabytes.

Drive weighs only three lbs. and it works directly from the 110 outlet and recharges at the same time. It recharges in six hours with thousands of pages transferred between charges. It's compact, with dimensions of 2¼" x 5½" x 7.5"; and fits easily into your briefcase along with your Model 100 or 200.

Machine code programs, BASIC programs, *Lucid* files and documents all are saved and retrieved with no protocol–instantly, ready to run.

In a special association, Holmes Engineering and PCSG have worked together combining the hardware knowledge of Holmes and the software expertise of PCSG. The result is a product that can only be regarded as excellent.

You see the disk directory instantly; works just like the main menu

Here is what is really exciting. The portable disk drive has Random Access. Included as part of the operating system in the drive (ROM) is a very powerful disk BASIC.

This means that you can have BASIC programs that will access the diskette and read and write records directly on the diskette.

Just imagine yourself with this kind of capability.

Database – The portable disk drive stores your mailing list, inventory items, part #s and descriptions or any other data that you need to recall.

358K on a diskette

Invoice (purchase order) – At the touch of a button you can print out your sequentially numbered, professionally done invoices. This is truly professional invoicing capability.

Purchase orders are just as easy.

Sort – This excellent utility allows you rapid sorting of any records you have compiled. You can write the newly sorted list back in the same file on the diskette or to a new file.

Telecom interface – If you are a user that likes to access other computers or databases (for example CompuServe) by telephone then this powerful facility alone is worth the price of the disk drive. You can automatically download and upload information onto the diskette.

Calendar – Everyone who has seen this program has said, "This is the first calendar/diary/scheduler on any computer anywhere that I can use. It is so functional."

The calendar program is usable for two reasons, first it is designed correctly, and second you have the memory (358K) on the diskette to log and access a tremendous amount of notes over a long period of time.

Personal Finance Manager – This wonderful program truly lets you keep track of your finances.

All your records are kept on the diskette. Bank accounts (checking and savings) and charge accounts such as MasterCard and Visa.

We at PCSG believe we have the ultimate Model 100 system, the Portable Disk Drive plus the *Lucid* spreadsheet on snap-in ROM, *Write ROM* word processing and the new 64K RAM expansion now available from PCSG.

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Circle 37 on Reader Service Card

Breaking Away from Your Laptop

Writing and playing arcade games on your portable computer.

By Alan L. Zeichick

It all started late one lazy afternoon. Reading Cy Callaghan's Hangman game put me into a whimsical mood, and instead of helping Portable 100 editor Park Morrison with the April issue, I sat down at the old keyboard and thought about computer games.

What makes one game a smashing success and another ho-hum? What do Monopoly, Pac Man and chess have in common? Well, for one they're entertaining. Secondly, they're challenging. And while winning is important, they give us a chance to improve our skills. Monopoly makes us into student bankers, Pac Man improves eye-hand coordination and chess teaches analytical thinking.

The response to the challenge is the reward — record scores or national tournament ranking based on our own growth. The goal isn't always to beat the opponent — but to beat our personal high score.

In my book any game, computer or otherwise, must be fair. Fairness means that the rules must be impartial and clearly-defined. It also means that increased ability will be reflected in higher scores. A good game might have random factors, but skill should always be challenged — and rewarded.

AN OLD FAVORITE

I'm not a video-game enthusiast, but one that I've always enjoyed is Breakout. I've encountered it in various incarnations, but the versions are usually similar: The object is to bounce a ball off of several "brick walls" using a paddle. Each time the ball hits a brick, it's removed from the screen. The object: To hit every brick without missing the ball.

Both skill and luck are factors in Breakout. The skill is in aiming the ball and knowing at what trajectory the ball will bounce off the paddle. Luck controls the initial velocity of the ball as well as its exact position — in my implementation, there's a very slight random modification to the ball's trajectory after each bounce.

My version of Breakout is written for the Tandy 200 because of its larger screen. However, if you want to run it on a Model 100, you'll only need to make a few program modifications. Start in line 150 by changing the value of SB to 60, BT to 56 and BB to 57. Also change the value of CT in line 270 to 52 and the 14 in line 280 to 8. Finally, in line 480 change the 70 to 40.

For a brief idea of the situation, take a look at the screen. At the bottom is the paddle, which moves horizontally with the < and > keys. (Actually the comma and period, since you don't need to press the Shift key.) I chose these because they seemed natural, but these keys can be changed in lines 450 and 460.

At the top of the screen are several rows of 14 bricks — four rows on the Model 100, eight on the Tandy 200. Pressing any key starts the game by propelling the ball downward — to make life easier, it always comes from the left side of the screen. Position the paddle so that the ball strikes it: It then bounces upward with its new angle dependent on where it hit the paddle.

If the ball hits a brick it'll bounce off — removing the brick and adding to

A$	Key read from keyboard
BA	Ball is in play: 1=yes, 0=no.
BB	Paddle's lower coordinate (119).
BC	Paddle's horizontal center.
BL	Paddle's left coordinate.
BR	Paddle's right coordinate.
BT	Paddle's top coordinate (118).
BX	Existence of each brick: 1=yes, 0=no.
CT	Count of bricks remaining.
HI	High score.
IT$	High scorer's initials.
OG	Use SCORE.DO for scores: 1=yes, 0=no
SB	Bottom of screen (124).
SC	Current score.
SL	Left side of screen (2).
SR	Right side of screen (236).
ST	Top of screen (2).
XL	Paddle sensitivity, which increases after each screen.
XM	Ball's horizontal velocity.
XP	Ball's horizontal position.
XV	Temporary horizontal value.
YM	Ball's vertical velocity.
YP	Ball's vertical position.
YV	Temporary vertical value.

The variables used in BRKOUT.BA. The numbers in parentheses indicate a constant value for the variable.

the score. If the ball hits the top or sides of the screen, it'll simply bounce off. Also, each row of bricks has a different value. On the Tandy 200 the bottom row is worth 10 points, and each higher row is worth more.

When you clear all but four bricks off of the screen, you'll get a new screen plus a 1000-point bonus. One catch: The ball becomes harder to control with each additional screen.

How does the game end? By failing to hit the ball. You can either miss it outright or it might roll down either the left or right "gutter." The latter is a good incentive to aim the ball, since there's space on both sides of the screen that the paddle can't reach.

A FEW EXTRAS

The program maintains a tiny file in random access memory (RAM) called SCORE.DO that stores the initials and score of the current record holder. After each game Breakout compares your score against the current high scorer. If you've beaten the record you'll be asked for your initials. The program accepts three letters, but be careful to look for extraneous periods and commas before typing them in. If you don't want Breakout to use SCORE.DO, change the value of variable OG (Old Game) to 0 at line 160. And no sneaking into TEXT to change your score!

I've also programmed a few arcade-style sounds — a different tone for bouncing off the walls, paddle and the each row of bricks. If you're musically-minded, you might want to play with the sound commands to make them a little more interesting.

LOOK INSIDE

The Breakout program is organized differently than most that I've written because of one overriding design constraint — speed. A truly structured program would run very slowly, making the game too boring to play. So, to make it faster, I've used many GOTO branches and multiple-line statements.

The top group of statements, lines 150 through 190, are executed only once. They control the initialization of screen variables, reading from SCORE.DO and drawing the box around the entire display.

Lines 240 through 260 are executed once for each game. They control displaying the high score and initializing the ball and paddle sensitivity. Lines 270 through 300 set up each screen by

Text continues on page 52

BRKOUT.BA, an arcade-type game for the Tandy 200. Modifications for the Model 100 are provided in the accompanying article.

```
100 ' Breakout -- Alan L. Zeichick
110 '
120 ' ======================
130 ' Initialize constants, variables
140 '
150 DEFSNG X
   :DEFINT A-W,Y-Z
   :BT=118
   :BB=119
   :ST=2
   :SB=124
   :SL=2
   :SR=236
160 DIM BX(20,32)
   :CLS
   :OG=1
   :HI=0
   :BL=106
   :BH=132
   :BC=119
   :LINE(BL,BT)-(BH,BB),1,B
170 IF OG=0 THEN 190 ELSE ON ERROR GOTO 180
   :OPEN "SCORE.DO" FOR INPUT AS 1
   :INPUT #1,IT$,HI
   :IT$=LEFT$(IT$,3)
   :GOTO 190
180 RESUME 190
190 ON ERROR GOTO 0
   :CLOSE
200 '
210 ' ======================
220 ' Draw the screen
230 '
240 IF SC>HI THEN HI=SC
   :PRINT @63,"";
   :INPUT "Initials:";IT$
   :IT$=LEFT$(IT$,3)
   :IF OG=1 THEN OPEN "SCORE.DO" FOR OUTPUT AS 1
   :PRINT #1,IT$;",";HI
   :CLOSE #1
250 IF HI>0 THEN PRINT @63,"      ";IT$;":";HI
260 SC=0
   :BA=0
   :XL=.2
270 CT=112
   :LINE(SL-2,ST-2)-(SR+3,SB+3),1,B
   :LINE(SL-1,ST-1)-(SR+2,SB+2),1,B
280 FOR YV=3 TO 14
   :FOR XV=1 TO 14
290 IF YV MOD 3<>0 THEN BX(XV,YV)=1
   :LINE(XV*16-7,YV*4)-(XV*16+6,YV*4+1),1,B
300 NEXT
   :NEXT
310 '
320 ' ======================
330 ' Read the keyboard & act
340 '
350 A$=INKEY$
360 IF A$<>"" THEN GOSUB 450
370 IF BA=0 THEN 350
380 LINE (XP,YP)-(XP+1,YP+1),0,B
   :XP=XP+XM
   :YP=YP+YM
```

Listing continues on page 52

Super Late but SuperGood

Despite delays, Super ROM lives up to its name.

By Carl Oppedahl

Super ROM from Portable Computer Support Group (PCSG) is the best general-purpose option ROM yet for the Model 100 and Tandy 200 (I reviewed the Model 100 version). The documentation, the support and the software itself combine to provide a great value at $199.95.

You get a ROM chip, three manuals in the white vinyl binders typical of PCSG products and three quick reference cards. The package comes with the chip taped inside one of the manuals. It would have been nice if they included a proper storage receptacle since people with several chips need somewhere to put those that aren't in use.

People who own other PCSG ROMs have noticed that each ROM has a different solid-color ribbon attached to help remove it from its socket. Super ROM, appropriately enough, bears a rainbow-striped ribbon representing the many programs it contains.

PHOTOGRAPH BY BENJAMIN MAGRO

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Circle 28 on Reader Service Card

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On ULTIMATE ROM II

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* ROM-VIEW 80 is not currently available for the Tandy Model 200. Model 200 customers will receive a coupon for a free copy of TS-DOS.

Trademarks: ThinkTank —Living Videotext, Inc., Guardian —PEAC, Multimate & dBASE —Ashton Tate, r:base 5000 —Microrim, Inc., WordStar —Micropro, Inc.

The manual explains in detail how to plug the chip into the option ROM socket. If you had another option ROM in there from before, such as Ultimate ROM, you'll have to follow the appropriate procedure to remove remnants of it from the menu. Then you type CALL 63012 (or 27801,0 on the Tandy 200) to finish the installation. If the ROM previously in use was from PCSG you can simply install Super ROM and menu-select the old ROM filename — the menu will be updated to reflect the new ROM in use.

Super ROM, Version 1.4
Multi-ROM for Model 100 and Tandy 200
Portable Computer Support Group
11035 Harry Hines Blvd #207
Dallas, TX 75229
214-351-0564
$199.95

When you select "Super" from the main menu you get a submenu. Each of the first four function keys are assigned a program. F1 is for Lucid (the spreadsheet), F2 will bring up Write ROM (the text formatter), F3 accesses Thought (the outliner) and F4 starts up Lucid Data (the data base manager).

Files, whether used for spreadsheet, text formatting, database, outlining or mail-merging must be in RAM to be processed by Super ROM. If you have a multiple-bank computer they must all be in the same bank. The combined size of files must be no greater than the amount of installed RAM less the system RAM area.

In simple terms, your spreadsheet, document or database must be no larger than about 29 kilobytes (K) in a 32K machine. This limitation is not as harsh as it may sound at first. Lucid and Thought are each quite economical in their use of RAM — a spreadsheet that just fits in a 32K laptop may require two or three times as much RAM in an IBM PC.

DOCUMENTATION

At over four pounds, Super ROM outweighs competing option ROM packages. You get three manuals, one for Thought and Lucid Data, and one each for Lucid ROM and Write ROM. The latter two manuals are identical to

Text continues on page 54

Which ROM Should You Buy?

	[1]Interactive Solutions	[2]Super ROM	[3]Ultimate ROM
Database	Good	Very Good	Very Good
Outliner	NA	Very Good	Very Good
Spreadsheet	Fair	Very Good	NA
Word Processor	Good	Very Good	Very Good
Language	Assembly	Assembly	BASIC
Program Integration	Good	Very Good	NA
Documentation	Poor	Very Good	Very Good
Printers Supported	Parallel	Serial & Parallel	Parallel
Price	$149.95	$199.95	$169.95
Reviews	Interactive Solutions - Nov 85	Lucid - Mar 85 Write ROM - Aug 85	T-base - Oct 84 Idea - Mar 85 T writer - Sep 85 Ultimate ROM - Oct 85

NA - Not Applicable

[1]Tandy Corp
1 Tandy Center
Fort Worth, TX 76102
(817) 390-3700

[2]Portable Computer Support Group
11035 Harry Hines Blvd.
Dallas, TX 75229
(214) 351-0564

[3]Traveling Software
11050 Fifth Avenue NE
Seattle, WA 98125
(800) 343-8080

That Fragile Option ROM Socket

Users have reported problems with the option ROM socket of the Model 100 and Tandy 200. When you pull out an option ROM chip, sometimes one of the spring-steel pins gets yanked out of shape. The first time this happens, you can usually coax it back into place with a steady hand and a pair of tweezers. The second time it happens, the pin breaks off and the socket is permanently damaged.

If anyone is to blame for this, it's Tandy. They could have designed the 100 and 200 so that commercially available EPROMs could be used. Instead they used a bizarre pin layout that requires special hardware to adapt an EPROM for laptop use.

No single hardware fix settles all concerns. The remedy selected by Traveling Software and Polar Engineering is a thin and fragile PC board which wraps around the EPROM. The board is degraded by repeated insertions and does not stand up well to abuse when out of the computer.

The remedy selected by PCSG is a thick glass-epoxy board which is soldered to the EPROM. It's sturdy and durable but a careless user can damage the ROM socket as mentioned above.

So when using an option ROM, regardless of manufacturer, it's wise to follow these precautions:

- When inserting a chip, do not push at its center as you could damage the erasing window.
- Be sure the chip is going in perfectly level and evenly.
- When removing a ROM, lift it with equal force at both ends.

—Carl Oppedahl

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WORKSHEET. This electronic spreadsheet features "plain-English" entries to make complex calculations. View countless "What if . . . ?" situations in seconds. You can print all or a portion of your spreadsheet. It's perfect for everything from personal finance to marketing.

FILER. Create a name-and-address file, small inventory list, recipe file, and more. Simple commands let you create and find files easily. You can sort files by one or more fields and print your files in any order you wish. Keep all your important information at your finger tips.

TELECOM. By adding a telephone modem, DeskMate lets you communicate with a host computer, information service, or another terminal. Information you receive can be printed or stored on diskette. You can also send files to other computers. TELECOM will even dial the phone number of anyone listed in FILER—at the touch of a key.

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CALENDAR. Set up an agenda for a month, as well as your daily appointment calendar. Finding, adding, and deleting events is easy. And you can also place events in an alarm file that will sound an alarm through the Model 4D's built-in speaker to remind you of appointments.

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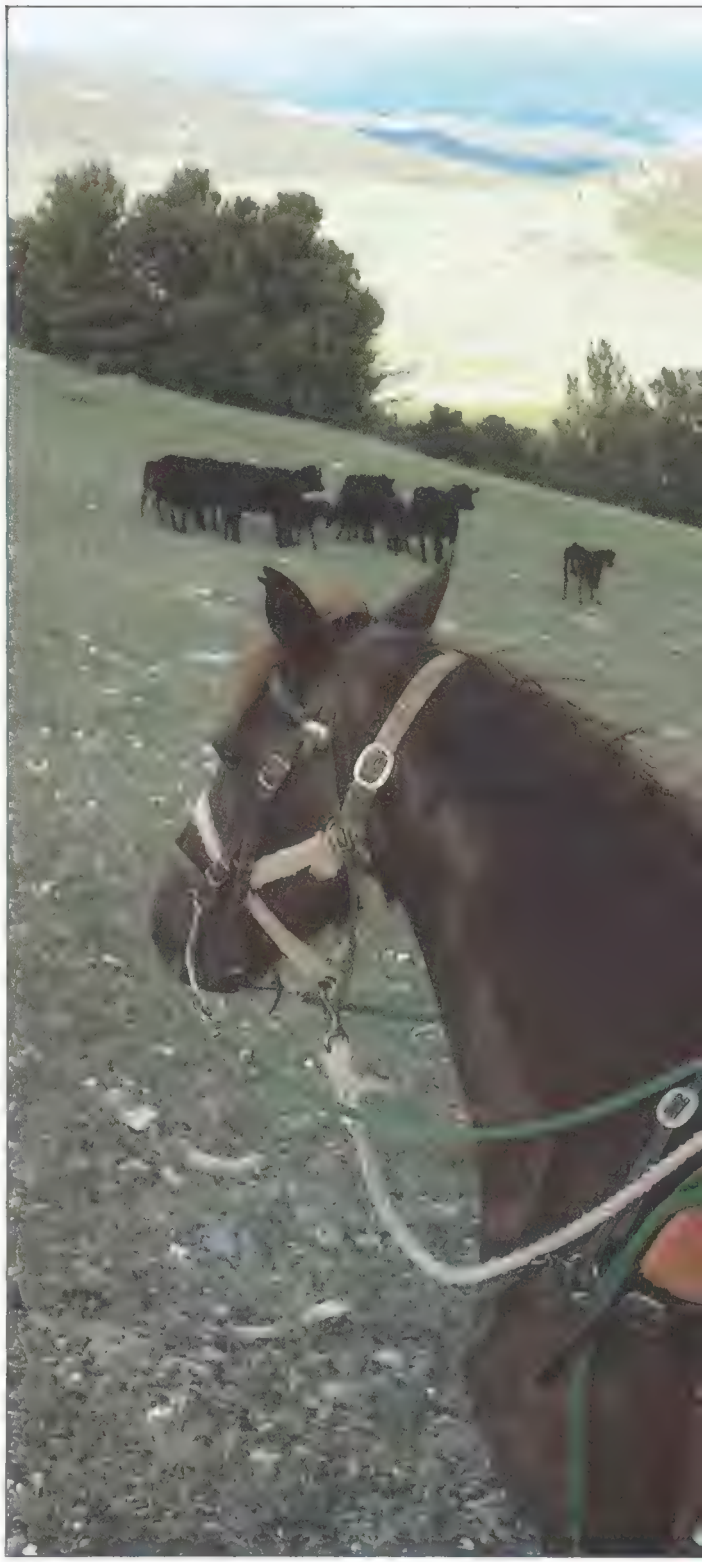
Down on the Farm

If old man MacDonald could see us now. Portable computers make their mark as the farmhands of the future.

By Grant Mangold



Right now, you could say agriculture needs fresh batteries. Like the red light on your Model 100, economic warning signals point to a failing farm sector. But at the same time, many computerized technological advancements lie ready to be unleashed — a burst of power that may well surge new life into American agriculture. "Agricultural productivity gains of the past 150 years have largely been tied to power," notes James Morrison, artificial intelligence project director at Purdue University, West Lafayette, Indiana. "But future gains will most likely come through the intelligent application of available power and technology, or by the replacement of power with information."

Some farmers, ranchers and agribusiness people have already harnessed computer power. For the most part, their use parallels that of other businesses: databases, spreadsheets, word processing, telecommunications. But the special needs of agriculture have sprouted some interesting applications. Here's a look at portable computers hard at work in agriculture...

Rick Allen typifies the new breed of farmer/rancher that corrals computer power to help make smarter decisions.

When he saddles up to check on his cattle herd, he invariably takes his Model 100 along. The computer keeps track of his 435 cows that roam 86,000 acres near Lander, Wyoming.

"With the Model 100 strapped to the saddle horn, I have instant access to records on all my cattle," he explains. A self-taught computer user, he modified the manual's 'sort' program to handle larger files — using the TEXT mode as a database manager.

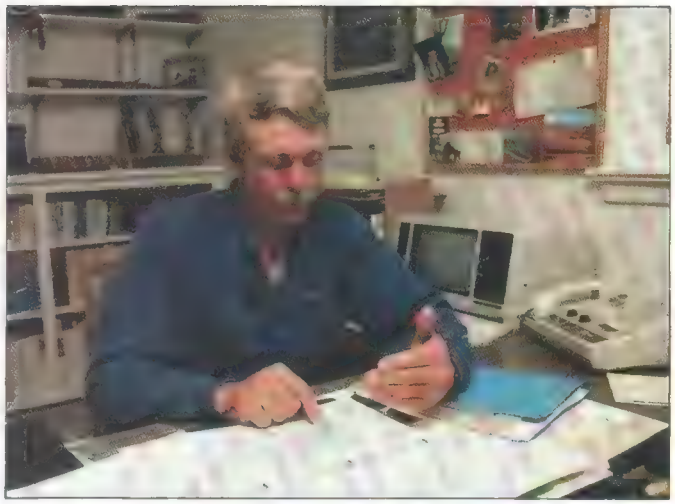
"It's simple, but quite effective in the field," notes Allen. "With the 'find' function, for example, I can pick out any cow in the herd, and record my field observations.

"The computer is incredibly tough," he reports. "It's been banged around a lot and it's held up extremely well. In foul weather, I just put it in a plastic sack. The Tandy 200 would not work as well in the field due to the flip-up screen."

Back at the ranch, he uses Disk Plus to dump the field data into his Radio Shack Model 4P for further analysis. "More often, I store the data on a Tandy disk drive — which has probably doubled my use of the Model 100," he says. "It's extremely satisfactory —very simple to operate. And 100K (kilobytes) of disk space is adequate for most purposes. With a

Grant Mangold is a freelance photo-journalist specializing in agriculture. He has worked for the American Soybean Association and was editor of Soybean Digest prior to returning to the family farm and writing.

PHOTOGRAPH BY BRUCE MCALLISTER



PHOTOGRAPH BY BRUCE MCALLISTER

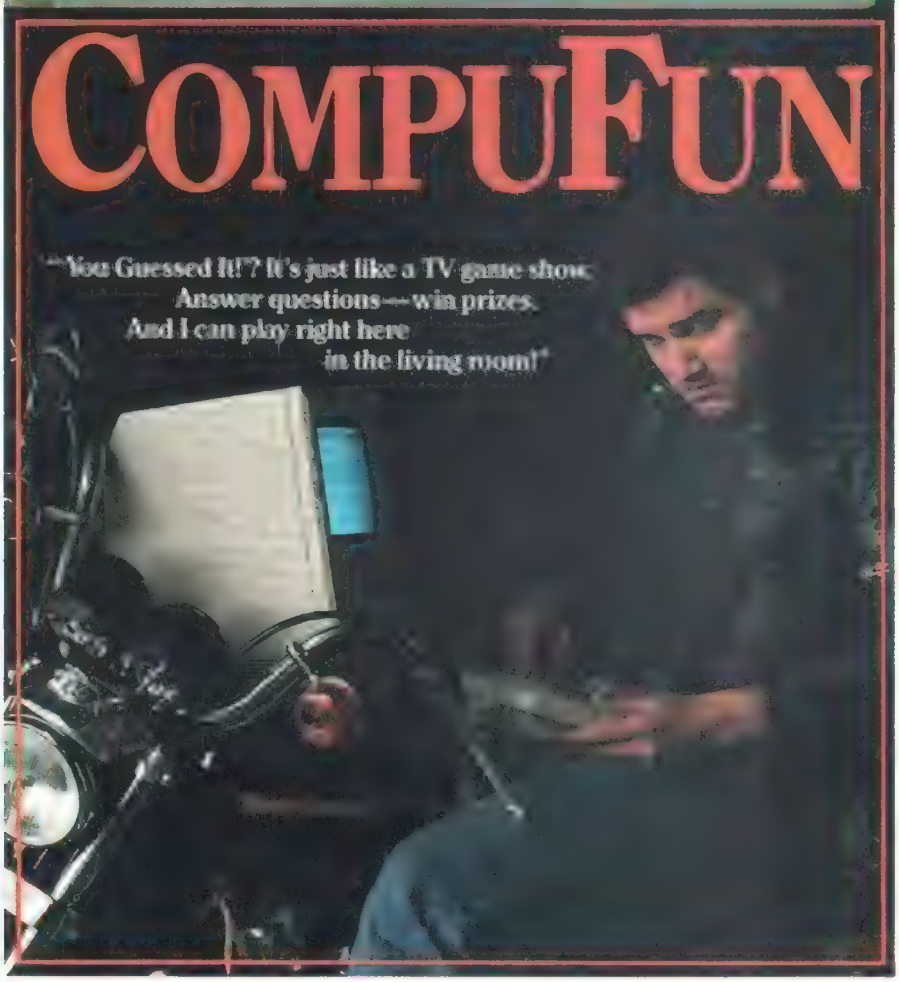
PHOTOGRAPH BY GRANT MANGOLD

Left: Rancher Rick Allen uses his Model 100 to keep track of his 435 cows that roam 86,000 acres near Lander, Wyoming. Top: Back at the ranch, Allen transfers his field data to a Model 4P for further analysis. Bottom: John Polk, manager of producer markets for Agri-Data Network, supervises two teams conducting marketing and financial management workshops for farmers.

24K Model 100, the disk drive was a better investment for me than extra memory."

He also runs Lucid to generate spreadsheet budget projections, enterprise analysis and cattle production records. "For spreadsheets I use the Model 100 almost exclusively — rather than the Model 4P. The program is very good and the machine is handier to use. And I'm interested in Super ROM to get Lucid, Write Plus and a database all in one ROM."

A time manager program helps him schedule his employees and keep track of the time necessary to complete ranch chores. In his spare time, Allen likes to access CompuServe.



FARMING

A Canadian sheep producer near Calgary, Alberta weighs his sheep right in the field using a portable scale coupled with an I/O board designed by Rainbow Computers, of Calgary. His Model 100 records the information to track rate of gain.

Back in the office, he dumps the data into his personal computer (PC) for database analysis. The PC also monitors market conditions via modem, accessing an electronic dial-up network. When the price is right, he knows which sheep are ready for market.

The Greenview and Twilight Hutterite colonies in Alberta, Canada rely on a Model 100 to control their two-million dollar feed-mixing installations. Using a Rainbow-designed I/O board, the portable computer orchestrates feed bins, augers, scales, grinders and conveyors to provide livestock with precise rations.

A Model 100 connected to an SIAS I/O board monitors temperature and moisture levels in stored foodstuffs for large poultry production units, notes Rob Kelly, senior engineer for SIAS Engineering, Salina, Kansas. "The operation went from a manual system to a fully automated system, with data running through a multiplexer to a Model 100."

"Portable computers can also control environmental systems in livestock production facilities," says Keith Schumann, president of S & S Programming, West Lafayette, Indiana. He uses his own Model 100 for taking notes. But he has bigger plans.

"We're working on a system for using a plastic-encased Model 100 for recording production data right in hog farrowing facilities. Keying data into a computer on the spot — rather than simply writing it down — saves time. The data will fit right into an integrated swine production module that we're developing for larger computers," he explains.

Another program that is in the works: using the bar code reader to scan animal health product inventories and prices.

Schumann also sees potential for field use. "Portable computers can be used for figuring proper chemical application rates and for recording crop production data," he says.

"On-board computers now monitor equipment performance on the go, adjusting speed and performance requirements based on field conditions. Soon, portable computers will control the equipment, store the data collected in the field, then dump into a larger

computer at the farm office for analysis," he explains.

Right now, Model 100-powered I/O boards and analog/digital converters (ADCs) promise increased agricultural production efficiency. Data World Products of Francestown, New Hampshire and Remote Measurement Systems, Inc. in Seattle, Washington report ADCs at work in various agricultural research applications, as well as actual on-farm use. Purdue and Kansas State Universities, for example, use Model 100s in soils research.

Elexor Associates of Morris Plains, New Jersey reports their I/O board and a Model 100 record crop harvest conditions on the go, while mounted on a combine. SIAS Engineering reports their I/O board controls planter and tillage equipment depth for farmers in Canada. Sensors relay data to a Model 100, which orders changes in depth-adjustment mechanisms. "Controllers which can operate on DC voltage are most useful for agricultural applications," says Kelly.

His firm recommends the Model 100 to clients — rather than building a custom-designed computer for field use.

"With telecommunications capabilities built right in, the Model 100 is absolutely perfect to receive and transmit huge amounts of data from telemetry devices," says Ken Thornton of Water Management Technologies, Polk City, Iowa. He uses a Model 100 to monitor plant stress — then to control chemical irrigation equipment to alleviate that stress. Instruments connected to the computer meter out precise levels of water and nutrients for controlled plant growth.

"The potential to increase yields with such a system borders on the fantastic," reports Thornton. "Such field uses are more applicable to California vegetable production, for example. But other states hit hard by the economic crisis in agriculture may find hope through climate-controlled production of crops not normally produced in their areas."

CALCULATE CROP COSTS

Jim Whittaker, a fertilizer and chemical dealer in Thrall, Texas, relies on a Model 100 for in-field spreadsheet analysis. "With Lucid, I can run comparative spreadsheets for my farm customers on the spot," explains Whittaker. "They can pick which fertilizer or chemical program they want to go with."

Whittaker especially appreciates the

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way Lucid remembers the previous cursor position when using the 'go-to' command. And he says it's easier to use than VisiCalc, which runs on his office computer.

Back in the office, Whittaker keeps customer records in the scheduler program. "The Model 100 works better than a speed-dialing telephone. I can ask for any part of a name, then the computer calls up that customer." He plans to put his customer records on the database program included in Super ROM. Keyed to crop interests, the database will help manage product promotional mailings.

His Model 100 also schedules the day's work for his employees. "They call up the date and get a listing for what products to deliver to each customer that day," he explains. They also key in supplies and parts that need to be ordered.

TAP INTO TELECOMMUNICATIONS

Jerry DeWitt, Iowa State University's integrated pest management (IPM) program coordinator, relies on Model 100 computers to transmit real-time data. "Our IPM field scouts send crop pest level data over the telephone to the university's VAX mainframe. The information is reported to the public the next day via the university's EXNET computer network, and through public television broadcasts and live radio reports," he explains. "The Model 100 provides an efficient and — most important — a rather inexpensive way of handling time-sensitive data."

DeWitt occasionally encounters producers armed with portable computers at farmer information meetings. They use them for taking notes — but also slip out to call up commodities market prices through electronic information networks.

Several networks offer services for farmers — allowing them to download programs, send and receive electronic mail, check the weather in grain-producing areas around the world, and even take correspondence courses in agricultural marketing — in addition to accessing time-sensitive commodity market information. One such dial-up data base is Agri-Data Network, based in Milwaukee, Wisconsin.

"My Tandy 200 is like my American Express card," declares Dan Nelson, Agri-Data Network vice-president for marketing. "I never leave home without it. On a recent trip to France, for example, I communicated daily with my office through electronic mail. It took only minutes — and bypassed time zone differences."

John Polk, manager of producer markets for Agri-Data, also keeps a heavy travel schedule — talking to farmers about how to use the network. An acoustic modem and portable Riteman printer go along as constant companions. "Supervising two teams conducting marketing and financial management workshops for farmers requires constant communication," he explains. "My Tandy 200 has given me the ability to manage over a widely dispersed geographic area in a very timely, efficient fashion."

WRITE ON, AGRICULTURE

Portable computers offer agricultural writers two big benefits: word processing and telecommunications capabilities.

Robert Dahle, an agricultural consultant based in Raleigh, North Carolina, taps his Model 100 mostly for word processing. "I use Write Plus for preparing articles, reports and for taking notes in the field," he relates.

"Potential for the Model 100 is tremendous. It can provide what I've always wanted in a portable computer. But right now there are two problems: expense and compatibility."

Dahle does most of his data analysis with an Apple II Plus with VisiCalc, keying in data recorded in the field on his Model 100. "My fruit and vegetable feasibility studies could be done with the Lucid and the Model 100 — right in the field," he acknowledges. "The expense of adding additional storage capacity holds me back.

"But because the major drawback is a matter of allocating resources, I may well evolve into greater reliance on the Model 100 in the future," projects Dahle.

Len Richardson, editor of the San Francisco-based California Farmer Publishing Company, uses his Model 100 for composing articles at his desk, at home or in the field. An interface dumps text directly into a typesetter.

A PRODUCTIVE FUTURE

"Lack of computer training, along with the depressed agricultural economy, discourages many farmers from adopting computers," reasons Gary Vincent, editor of *Farm Computer News*, Des Moines, Iowa. "But computer use by farmers will continue to grow. When we first surveyed computer use in 1980 less than one percent of the readers of *Successful Farming* (a sister publication with 600,000 subscribers) owned computers. That increased to 11 percent by mid-1985." And beyond the farm gate, many agribusinesses are increasingly relying on computer power.

With these new farmhands — computers — and their special capabilities, American agriculture just might maintain its traditional high rating for efficiency and production.

Beyond that, portable computers will very likely help to revolutionize the whole farm-to-food system — including the way you get the food you eat.□

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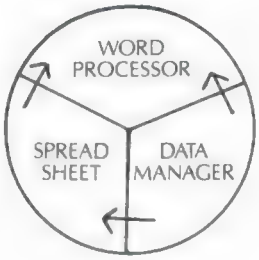

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Downsizing Effort Falls Short

Project management software originated on mainframes with plenty of memory. Maybe it should have stayed there.

By J.D. Hildebrand

Computer users are a fickle bunch. In 1979 and 1980 they discovered VisiCalc, and electronic spreadsheets surpassed word processing programs as the most talked-about applications available for micros. Then came integrated software, the buzzword of 1983. Presentation graphics, environment managers, desktop publishing systems and telecommunications — they've all had their day in the sun.

The latest programs to turn reviewers gaga are project planners that allow managers to allocate time, manpower and resources efficiently when planning complicated jobs.

PHOTOGRAPH BY BENJAMIN MAGRO

Input, a Mountain View, California-based market research firm, says the project management software market will grow from $28 million in 1985 to $82 million by 1990 — that's a 24 percent compounded annual growth rate. So it's no wonder that software megacompanies like Microsoft, Sorcim/IUS (recently purchased by Computer Associates) and Software Publishing are getting into the act.

Many project management software users are construction crew leaders and others whose work takes them to the job site. It's natural for these users to want portable project management systems that they can carry along with them. Project planners make up a significant portion of the users who've parted with big bucks for a laptop Data General One. Project management is likewise popular on the IBM-compatible Morrow Pivot and Grid Systems GridCase laptops.

It was only a matter of time before someone developed a project management program for a low-cost laptop like the Model 100 or Tandy 200. That program has materialized in Project Scheduler, a $39.95 machine-language program developed by DCM Data Products (the same fine folks who brought you the Tandy Integrated Solutions ROM) and marketed under the Tandy label.

While there's a verifiable market — and a pressing need — for a Tandy 200 project manager, Project Scheduler fails to satisfy. The program lacks sufficient capacity to manage even modest jobs, and it performs only rudimentary functions. For most users, keying in job data is probably more trouble than Project Scheduler's limited capabilities can justify.

Project Scheduler is based on the Critical Path Method (CPM), one of two major schools of project management. CPM planners identify the critical tasks within a long-term job by comparing task start dates, durations and prerequisites.

If you're building a house, for instance, a CPM project planner might highlight "Install electricity" as a critical-path task. If there's a delay in installing electricity, there will also be a delay in installing the heating system and the house won't be completed on schedule. That's what makes "Install electricity" a critical task: If it's not completed on time, the whole

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```
                              SCHEDULE GRAPH
                              --------------

PROJECT NAME: Hideaway                  REPORT DATE     : 07/02/85
START DATE  : 07/01/85                  COMPLETION DATE: 08/02/85
TIME UNIT   : Days

 JOB  NAME           Jul
-------------------1..2..3..8..9..10.11.12.13.15.16.17.18.19.20.22.23.24.25.26.
 1 Build foundation X+++++++++++++++++++++++++++++++>.....>
 2 Make frames/roof X+++++++++++++++++>...................>
 3 Install frames                                  >++++++++>.....>
 4 Side/window/door                                          >++++++++++++++>..
 5 Finish doors,etc                                                        >++
 6 Install plumbing
 7 Insulation                                                              >++
 8 Electricity                                                             >++
 9 Install cabinets                                                        >++
10 Install heating
```

Sample report produced by Tandy's Project Scheduler.

project will fall behind schedule.

The other approach to project management is called PERT (Program Evaluation and Review Technique). It was developed in 1958 to manage the U.S. Navy's Polaris Fleet Ballistic Missile project, whose development it speeded by two years. Both CPM and PERT are based on the work of Henry L. Gantt, an industrial engineer who in 1914 pioneered the application of analytical techniques to production problems.

Generally speaking, PERT is appropriate for planning and controlling nonrepetitive jobs that haven't been done before. CPM is more appropriate for tasks where data from past experience is available.

Project management programs have been a common part of the mainframe software arsenal since the 1960s. Memory requirements delayed their introduction on micros until about 1980.

The first microcomputer-based project managers were, like Tandy's Project Scheduler, based on CPM planning techniques. They stored information about a limited number of subtasks (usually about 200), covered relatively short time spans and allowed users to define only simple finish-to-start activity relationships. Early programs frequently suffered from just one or two reporting facilities, inflexible time units and no provision for apportioning resources other than time.

Project Scheduler suffers from all of these limitations and more.

THEY CALL IT AMNESIA

Project Scheduler's usefulness on the Tandy 200 is limited primarily by the 200's lack of memory. Every detail of the program shows clear evidence of programming compromises.

The most immediately noticeable compromise is the procedure required to load and run the program. Because it's written in machine language, Project Scheduler would customarily be stored in the 200's memory as a .CO file, would appear as such on the menu and would be accessible from the menu level with the 200's familiar wide-bar cursor.

But Project Scheduler is too big to store. You can load it into memory and run it, but you don't have adequate memory left to store it as a .CO file. To run the program you must enter BASIC and type the command *CALL 50600.* This should have been a clear indication to DCM's programmers that they were trying to squeeze a full-size bull into a Barbie doll china shop.

Inconvenient? Sure — and dangerous. Project Scheduler is designed to stay tucked away above HIMEM while you run other programs. But if any of your programs reset HIMEM, load machine-language routines or clear memory space for strings, they try to occupy the same memory locations as Project Scheduler. The result is a locked-up machine that must be cold-booted.

Project Scheduler allows the user to break down each job into as many as 50 tasks. While this sounds like a lot, it's actually insufficient for even the simplest of projects. Brian Pace, project management software analyst for Pacific Gas & Electric Co. in San Francisco, identifies 1,000 as the minimum number of tasks that should be handled by a micro-based project planner, and won't consider anything fewer than 2,000 tasks for PG&E use.

It's possible to apply Project Scheduler to real applications by consider-

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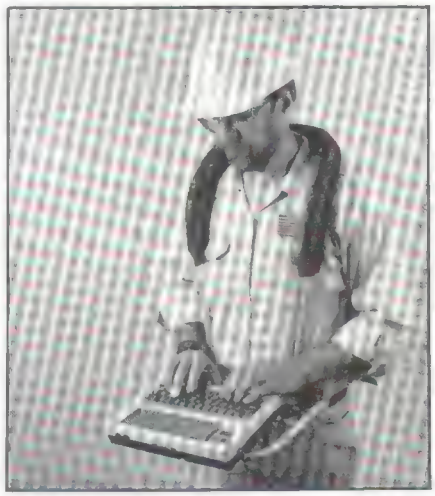

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PROJECT

ing it a simple scheduler and concentrating on main components of the job — not the individual subtasks customarily tracked by project management programs. This approach is taken in the program's manual, in which a house-building project consists of just 10 tasks. Task two is "Make frames and roof," but there's no mention of pricing, ordering and cutting the lumber, nor of designing a framing plan, nor of scheduling time with subcontractors. A simple reminder to "make frames and roof" has extremely limited value.

The house-building project highlights another Project Scheduler weakness: The program doesn't track ex-expenses or materials. Most project managers currently on the market allow managers to assign different cash values to the different types of work that are done on a project, and allow users to optimize return by minimizing expensive labor time. Many are sensitive to discounts for ordering materials early. Some produce financial reports showing cash requirements at each stage of the project. All of these capabilities make project management software more useful — and all are missing from Project Scheduler.

The program allows users to assign each task as many as four prerequisites — tasks that must be completed before work can begin. But this doesn't adequately mirror real-life situations. Most real-life projects include partial dependencies in which work can begin on one task when others are 50 percent or 25 percent completed. The program's insistence that one job be finished before another starts inhibits its accuracy as a scheduling tool.

PROGRAM OPERATION

The first task in defining a new job with Project Scheduler is to define the time-units in which task duration will be measured. The program accepts days or weeks. If you select days, you'll be prompted for "offdays" — days on which you don't work. You can select none, one or two (Saturday and Sunday, for instance). You can also create a TEXT file called Offdays in which you define as many as 20 additional dates during which you don't work — July 4, December 25, whatever.

Data entry for job subtasks is accomplished by pressing F1 (or "A" for "Add"). You're presented with a fill-in form with prompts for job name, duration, four prerequisites and the earliest start date. The earliest start date is the first date the task can begin

assuming all the prerequisites are met.

This procedure is used to compile information on each of the job's subtasks — as many as 50 in all. Tasks may also be recalled by number and modified. This is a handy feature that allows

Project Scheduler
Portable planner for
Tandy 200
Tandy Corp.
1 Tandy Center
Fort Worth, TX 76102
$39.95
Circle No. 150

managers to examine the effects of potential delays and speed-ups, and of reconsidering the order in which tasks are begun.

Another handy feature is the program's automatic calculation of slack time: the number of time units between a task's estimated completion date and the latest date it can be completed without making the whole job late.

That's all there is to it. Based on this data, Project Scheduler produces three reports.

The project schedule table merely lists the job's tasks, identifying those on the critical path and noting the early and late start and finish dates, plus the slack time.

The prerequisite report presents tasks listed numerically with their prerequisites listed alongside.

And the schedule graph is a traditional Gantt chart that plots tasks as horizontal lines across a calendar grid. The schedule graph distinguishes between critical and non-critical tasks, and shows which tasks have been completed at the time of the report. Slack time is also shown.

Reports may be previewed on the 200's screen or printed with an 80-column or 132-column printer. Eighty-column printouts are limited to about 25 time units, with the remainder of the job graphed on a second page.

SILVER LINING DEPT.

Project Scheduler is too limited to be of use as a project management tool on just about any job. Most users will find, as I have, that Traveling Software's Idea can easily be adapted to project management. It's a better alternative.

Project Scheduler isn't the project management program that laptop users have been waiting for. But at least the price is right.□

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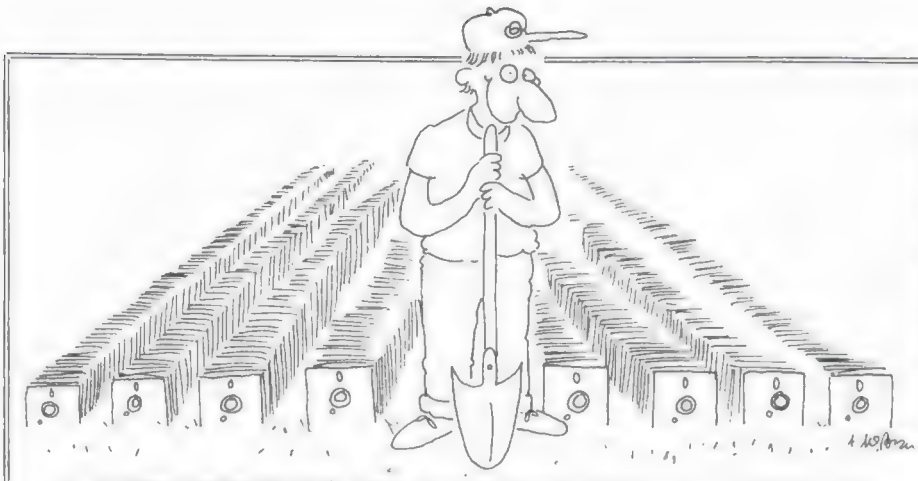

ATTENTION: Dyed-In-The-Wool Programmers, Hackers and Software Designers

Until now, one of the great limitations to computer publishing is the number of programs, ranging from wonderful to fascinating, that never see the light of day.

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REVIEWS (from page 16)

(Paul Perry continued)

There is a problem with the way the OPEN instruction works. If you attempt to open two files on the disk drive at once there's a possibility of destroying one or both files — and there's no protection against doing so. Although the documentation warns about this, the program doesn't trap any attempt to access a second file. While this shouldn't be a problem under normal circumstances, it is rather dangerous. BASIC programmers should especially take note.

A USEFUL UTILITY

MENU.BA is a neat utility program for the novice user. It allows you to examine random access memory (RAM) contents and move files back and forth between your portable and disk drive with keystroke ease. Filenames no longer have to be typed.

Access the program by placing the widebar cursor over MENU.BA and hitting Enter. The subsequent display differs from the main menu in that it groups files by type and presents them on three separate screens. Each screen displays one type of file. Pressing a function key switches between screens.

The program works on files in memory as well as files on disk. Pressing another key toggles between the two.

Each screen shows the number of bytes free, where the files are resident (disk drive or RAM) and the files' type (.DO, .BA or .CO). File size is displayed in the upper right corner.

The arrow keys move the widebar cursor. All operations are carried out using the functions keys. You can load, save or kill files individually or as a group. The latter allows you to back up all of your RAM files at once

All features of MENU.BA work well. It uses about 3.5K of memory in addition to that required by Powr-Disk.

Besides MENU.BA, Powr-Disk offers no convenient way to find out how much free space is available on disk. LFILES reports *sectors* free but you have to read the entire directory to find it. The manual says the number of free sectors is more meaningful than the number of bytes because all files, no matter how small, require at least one sector. I would still prefer a command which displays how many bytes are free.

Renaming a file and formatting a disk are not supported by Powr-Disk. Apparently a substantial amount of memory is saved by not offering these

features. You sill must use FLOPPY .CO to perform these functions. I didn't find this a problem.

The program comes with a small manual that's packed full of useful and interesting information. There's a great section in back explaining how to use machine language programs in the Model 100. Some of the instructions are unclear but it's a great source of information on the Tandy disk drive.

Powr-Disk makes the Tandy Portable Disk Drive a very powerful piece of equipment. I recommend it to anyone who owns a disk drive. It's been invaluable to me.□

(from page 16)

(Mark Schorr continued)

Powr-Disk comes with a clearly-written 32-page manual that's chocked full of tips on how to get other machine language programs to live with Powr-Disk and FLOPPY.CO. The manual is written more for sophisticated users but there's plenty of information for the novice as well.

The manual explains how to use all the utilities with or without the file management program MENU.BA. This program lists files (and file size) contained on disk or in RAM. Using the widebar cursor and function keys you can save, load or kill a selected file (or files) from disk or RAM.

Another particularly useful feature of MENU.BA allows you to view the first line of a BASIC program or text file. You can also list TOP or END values, or EXEcution point.

The manual lists nine error codes. All follow the Tandy's two-letter style (i.e.-AE = Already Exists). I purposely induced the six most common ones and was instructed on how to correct my mistakes.

At this writing, neither this program nor any that I know of makes the Tandy disk drive into a random access storage device. However, the clever way it allows users to upgrade their present BASIC, text and application program libraries with just a few minor additions should be seen as a major tradeoff.

I, for one, don't feel any shortage of speed and convenience with sequential access.

By the time I returned from the weekend, I had logged just as many tracks and sectors on my disk drive as air miles to Chicago. My disk drive will never be without Powr-Disk.□

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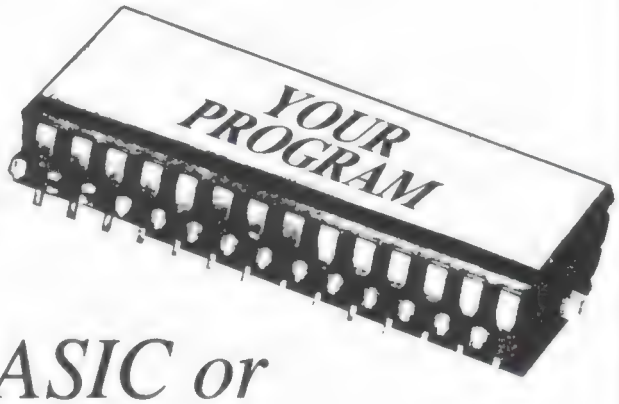

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ter. However, software and imprinter may be purchased separately for use with the Model 100.

Models range from a low-cost manual feed unit up to a fully automatic alphanumeric imprinter. Printing features include 21 characters per line, one to four lines per cardboard or polystyrene slidemount, automatic line centering, sequential numbering and automatic feed and take up. Up to 70 mounts can be produced per minute.

Slidetypers range in price from $650 to $3250. For more information contact Trac Industries, Inc., 3447 County Line Road, Chalfont, PA 18914, (215) 822-2723.

Circle No. 82

Three New Ones

Structured Software Services has announced three new machine language programs for the Model 100.

Lister produces formatted listings of BASIC programs directly from RAM for printing or viewing on the LCD. It prints one command per line, inserts spaces between keywords and variable names and indents groups of commands that exist at the same logical level within FOR-NEXT loops and IF-THEN-ELSE statements.

Another program, Verify, gives users the tape verification command for .DO files that Tandy left out. Similar to CLOAD? and CLOADM?, Verify compares text files in RAM with copies on tape to insure a reliable backup has been made. It allows the RAM and tape files to have different names without affecting the rest of the comparison.

Renumber is a utility for renumbering BASIC programs without requiring a separate ASCII .DO copy. Ranges of lines or entire programs can be renumbered, with the user supplying the starting number and increments. Before changing line numbers, extensive error checking is performed to validate the renumbering.

Lister, Verify and Renumber are available for $19 each. Contact Structured Software Services, 9233 N.E. 269th Street, Battle Ground, WA 98604.

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wonderful things. The letter is displayed in a box marked "Used Letters." It works in conjunction with the subroutine at 1700 to determine which body part to display and where to print the used letter. Sounds and print directions to clear parts of the screen are at appropriate points throughout.

Each time an incorrect guess is processed the variable N increases by one, causing line 1560 to choose a different GOTO command for the next wrong letter. On the eighth one, you die.

If you select a letter that has already been guessed, you'll be prompted "Already Guessed" and the program will wait for a new choice. Lines 1410 an 1440 carry out this feature.

EVERYONE LOVES A WINNER

But how do you know a winner when you have one? HANGMN.BA keeps track of the number of correct guesses and when that number matches the number of letters in the secret word, a win is declared. The WN string variable counts the correct letters.

Since the commands to print the wrong letters in a box and draw the figure are needed with each wrong letter, the declaration of a loss was just tacked onto the eighth wrong guess at line 1650.

> The goal was a stick man as opposed to a Rubenesque art form.

How did you draw that little man? Sweat. The Tandy 200 is certainly a wonderful computer but when you get down to its field of 30,000 pixels its a little less awe-inspiring.

Having the hanging post and rope in place, a temporary box was inserted to define the field where the "hanged" man was to appear. Taking the coordinates of that box, I switched to graph paper (you shouldn't try to do *everything* on a computer).

With the coordinates on paper, I drew an outline of the figure I wanted. After a few refinements the blocks that the lines passed through were filled in, each representing one pixel. The goal was a stylized stick man as opposed to a Rubenesque art form.

Any group of pixels that could be expressed as a box were put into the program using BF after the LINE coordinates. The LINE commands for the different body parts were separated so each could be used as one subroutine when that part was drawn.

The music was worked out on a piano and the chords were converted to the pitches which appear in the program. The beeps for right, wrong and already guessed letters were carefully selected so they would become identifiable to the avid player. A secret formula having something to do with the standard notes for car horns was used.

So play on. But some words to the wise. If you're going to have a group of friends over to play HANGMN.BA be sure to have some extra batteries or a converter handy. Your 200 is likely to be running all evening. And remember, no dirty words when Mom's over.□

Listing begins on page 48

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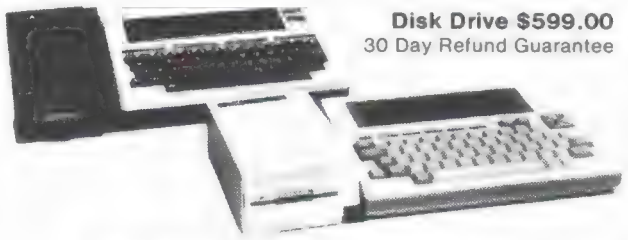

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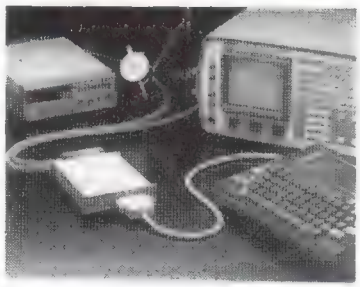

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HANGMAN

HANGMN.BA, a version of the old classroom-classic Hangman for the Tandy 200.

```
1000 ' ********* Hangman by Cy Callaghan
1010 ' ********* (c) 1986, PRIME MARKETING
1020 ' ********* Title screen
1030 CLS
1040 LINE (32, 32)-(80, 80)
    :GOSUB 1270
1050 LINE (32, 32)-(80, 80), 1, B
    :GOSUB 1270
1060 LINE (32, 60)-(160, 35), 2, BF
    :GOSUB 1270
1070 LINE (32, 32)-(80, 80), 1, BF
    :GOSUB 1270
1080 LINE (32, 60)-(160, 35), 2
    :GOSUB 1270
1090 LINE (32, 60)-(160, 35), 1, B
    :GOSUB 1270
1100 LINE (32, 60)-(160, 35), 1, BF
    :GOSUB 1270
1110 PRINT @27, "(c) 1986"
    :GOSUB 1270
1120 PRINT @340, "HANGMAN"
    :GOSUB 1270
1130 PRINT @380, "by Cy Callaghan"
    :GOSUB 1270
    :PRINT ""
1135 PRINT"SET <CAPS LOCK>"
1140 LINE INPUT "Press <ENTER> to play
                 <R, ENTER> for rules"; Z$
1150 IF Z$="" THEN 1180
1160 IF Z$="R" OR Z$="r" THEN 1930
1170 ' ********* Actual start of the program
1180 CLS
    :N=0
    :WN=0
    :AI=0
    :G$=""
    :B$=""
1190 GOSUB 1300
1200 INPUT "What's the word"; A$
1210 CLS
1220 NS=LEN(A$)
1230 PRINT
    :PRINT
    :PRINT STRING$(NS, 45)
1240 GOSUB 1300
1250 GOSUB 1340
1260 ' ********* Delay loop
1270 FOR X=1 TO 200
1280 NEXT X
1290 RETURN
1300 ' ********* Draw hanging tree
1310 LINE (140, 10)-(150, 125), 1, BF
    :LINE (120, 10)-(210, 20), 1, B
    :LINE (195, 20)-(195, 40)
1320 PRESET(145, 12)
    :PRESET(142, 15)
    :PRESET(148, 15)
1330 RETURN
```

HANGMAN

```
1340 ' ********* Enter guessed letters
1350 PRINT CHR$( 1)
1360 LINE (0, 32)-(90, 48), 0, BF
     :LINE (0, 104)-(90, 120), 0, BF
1370 PRINT "Which letter?"
1380 B$=INKEY$
1390 IF B$=CHR$(27) THEN MENU ELSE IF B$<"A" OR
     B$>"Z" THEN 1380
1400 PRINT B$
1410 AI=INSTR(G$, B$)
1420 IF AI>0 THEN SOUND 3321, 25
     :PRINT @287, "Already used"
     :GOSUB 1270
     :PRINT @287, "              "
     :PRINT @449, ""
     :GOTO 1340
1430 ' ********* It's not a used letter
1440 G$=G$+B$
1450 LO=INSTR(A$, B$)
1460 IF B$=CHR$(27) THEN MENU
1470 IF LO>0 THEN PRINT @LO + 79, B$
     :SOUND 2216,10
     :WN=WN+1 ELSE 1540
1480 IF WN=NS THEN GOTO 1900
1490 LA=INSTR(LO+1, A$, B$)
1500 IF LA=0 THEN GOTO 1340
1510 LO=LA
1520 GOTO 1470
1530 ' ********* Picked a bad letter
1540 PRINT @297, "WOOPS"
     :SOUND 6642, 25
     :PRINT @297, "      "
     :LINE (1, 65)-(84, 100), 1, B
     :PRINT @361, "Used Letters"
1550 DR=N+1
1560 ON DR GOTO 1570, 1590, 1600, 1610, 1620, 1630,
     1640, 1660
1570 PRINT @441, B$
     :N=1
1580 GOSUB 1700
     :GOTO 1340
1590 PRINT @442, B$
     :N=2
     :GOSUB 1750
     :GOTO 1340
1600 PRINT @443, B$
     :N=3
     :GOSUB 1770
     :GOTO 1340
1610 PRINT @444, B$
     :N=4
     :GOSUB 1790
     :GOTO 1340
1620 PRINT @445, B$
     :N=5
     :GOSUB 1810
     :GOTO 1340
1630 PRINT @446, B$
     :N=6
     :GOSUB 1830
```


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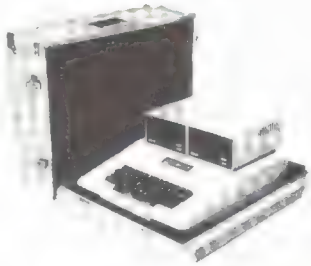

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```
      :GOTO 1340
 1640 PRINT @447, B$
      :N=7
      :GOSUB 1850
      :GOTO 1340
 1650 ' ********** You're dead!
 1660 PRINT @448, B$
      :N=0
      :GOSUB 1870
 1670 SOUND 2348, 25
      :SOUND 2348, 25
      :SOUND 2348, 12
      :SOUND 2348, 25
      :SOUND 1975, 25
      :SOUND 2092, 12
 1680 SOUND 2092, 25
      :SOUND 2348, 12
      :SOUND 2348, 25
      :SOUND 2484, 12
      :SOUND 2348, 50
 1690 PRINT @346, "You are dead"
      :PRINT @120, A$
      :GOTO 2000
 1700  ' ********** Draws head
 1710 LINE (193, 42)-(195, 44), 1, BF
      :LINE (192, 43)-(194, 45), 1, BF
      :LINE (191, 44)-(192, 46), 1, BF
      :LINE (190, 45)-(190, 51)
 1720 LINE (192, 53)-(196, 53)
      :LINE (199, 45)-(199, 50)
      :LINE (196, 43)-(197, 43)
      :LINE (198, 44)-(198, 45)
 1730 LINE (192, 48)-(193, 48)
      :LINE (196, 48)-(197, 48)
      :LINE (193, 51)-(195, 51)
      :LINE (193, 54)-(193, 55)
      :LINE (195, 54)-(195, 55)
 1740 PSET(191, 52)
      :PSET(194, 49)
      :PSET(198, 51)
      :PSET(197, 52)
      :RETURN
 1750 ' ********** Draws body
 1760 LINE (193, 55)-(184, 58)
      :LINE (195, 55)-(204, 58)
      :LINE (183, 62)-(188, 81)
      :LINE (205, 62)-(200, 74)
      :LINE (200, 75)-(200, 81)
      :LINE (188, 81)-(200, 87), 1, B
      :RETURN
 1770 ' ********** Draws arm #1
 1780 LINE (184, 58)-(176, 58)
      :LINE (176, 58)-(169, 53)
      :LINE (167, 53)-(175, 61)
```


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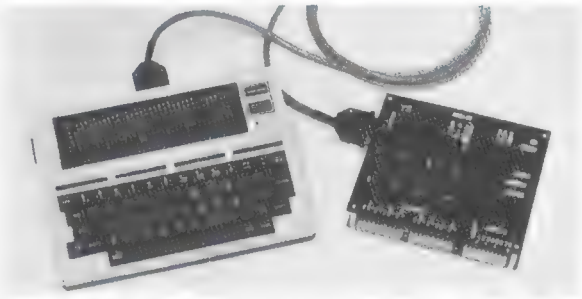
```
    :LINE (183, 62)-(175, 61)
    :LINE (166, 49)-(168, 52)
    :LINE (169, 50)-(169, 51)
    :RETURN
1790 ' ********* Draws arm #2
1800 LINE (204, 58)-(212, 58)
    :LINE (212, 58)-(217, 53)
    :LINE (219, 53)-(213, 61)
    :LINE (213, 61)-(205, 62)
    :LINE (220, 50)-(220, 53)
    :RETURN
1810 ' ********* Draws leg #1
1820 LINE (188, 87)-(183, 98)
    :LINE (183, 98)-(190, 110)
    :LINE (193, 89)-(188, 99)
    :LINE (188, 99)-(193, 110)
    :RETURN
1830 ' ********* Draws leg #2
1840 LINE (196, 89)-(201, 99)
    :LINE (201, 99)-(197, 110)
    :LINE (199, 110)-(205, 98)
    :LINE (200, 87)-(205, 98)
    :RETURN
1850 ' ********* Draw foot #1
1860 LINE (194, 110)-(186, 112), 1, B
    :RETURN
1870 ' ********* Draws foot #2
1880 LINE (196, 110)-(204, 112), 1, B
    :RETURN
1890 ' ********* Won the game
1900 PRINT @306, "W I N N E R"
1910 FOR S=6642 TO 622 STEP -50
    :SOUND S, 2
    :NEXT S
1920 GOTO 2000
1930 ' ********* Rules
1940 CLS
    :PRINT @58, "R U L E S"
1950 PRINT
    :PRINT "1. Remain in upper case, with CAPS LOCK
     on."
1960 PRINT
    :PRINT "2. Words may be up to 20 letters long.
1970 PRINT
    :PRINT "3. You can stop by pressing the Escape
     key."
1980 PRINT
    :PRINT "4. Programs located in high memory may
      stop the game and require a machine
      reset."
1990 ' ********* Restart the game
2000 PRINT @560,""
    :LINE INPUT "Push <ENTER> to play / F8 for
     Menu";P$
2010 IF P$="" THEN 1180 ELSE MENU
```

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initializing the count of the bricks and drawing the bricks onto the screen.

Now the fun begins. Lines 350 through 400 comprise the main body of the program — a continuous loop that monitors the keyboard and checks to see where the paddle's going.

Lines 350 and 360 check the keyboard for an interrupt and calls the subroutine at lines 450 through 490: a period to move the paddle left, a comma to move it right and the Escape key to end a game. If the ball's not in motion, pressing any key starts it moving.

Line 370 branches back to line 350 if the ball's not in motion.

Line 380 removes the current ball from the screen; it's drawn as a two-by-two pixel square. The line then adds the horizontal and vertical displacements to calculate a new ball position. If the ball hits any of the sides of the screen, the program branches to line 540. The lines of code at that location sound a tone and reverse the ball's direction, depending on which wall was struck. If the ball went off the bottom of the screen, the program branches back to line 240 to start a new game.

Line 390 draws the new ball position. It then checks to see if the ball's on the same row as the paddle — if so, it jumps to line 610, which looks for an intercept and makes the ball bounce. Why have a separate jump? The more program code between lines 350 and 400, the slower the program; and since most of the time the ball won't be near the paddle, it's better to branch outside the loop than to always slow it down.

Back to line 390: If the ball isn't on the paddle's row, the line checks to see if it's near a brick — and since the bricks are spaced four rows apart, an easy way to check is to see if the ball position is a multiple of four. If so, the program branches to line 660, which performs the more difficult calculations of determining which brick the ball has hit — if any. If so, line 670 removes the brick, decides the brick's score and tests to see if you deserve a 1000-point bonus and a new screen.

SMASHING SUCCESS

I'm not going to assume that my version of Breakout will be the next arcade craze — but I'll say that the Portable 100 staff, including editor J.D. Hildebrand and senior editor Park Morrison, have been playing incessantly — enough for art director Paige Parker to complain about "excessive noise pollution during business hours."

It's not easy being an editor.□

```
    :IF XP<SL OR XP>SR OR YP<ST OR YP>SB THEN 540
390 LINE (XP,YP)-(XP+1,YP+1),1,B
    :IF YP=BT THEN 610 ELSE IF YP MOD 4=0 THEN 660
400 GOTO 350
410 '
420 ' ======================
430 ' Key is pressed
440 '
450 IF A$="." THEN IF BH<SR-10 THEN BL=BL+10
    :BH=BH+10
    :LINE(BL-1,BT)-(BL-10,BB),0,B
    :LINE(BH,BT)-(BH-9,BB),1,B
    :BC=BC+10
    :RETURN ELSE RETURN
460 IF A$="," THEN IF BL>SL+10 THEN BL=BL-10
    :BH=BH-10
    :LINE(BH+1,BT)-(BH+10,BB),0,B
    :LINE(BL,BT)-(BL+9,BB),1,B
    :BC=BC-10
    :RETURN ELSE RETURN
470 IF A$=CHR$(27) THEN MENU
480 IF BA=0 THEN BA=1
    :XM=RND(1)*2+1
    :YP=70+2*INT(RND(1)*3)
    :XP=2
    :YM=2
    :PRINT @42,"                "
490 RETURN
500 '
510 ' ======================
520 ' Hit a wall
530 '
540 IF XP<SL OR XP>SR THEN XM=-XM
    :SOUND 4100,2
    :IF XP<SL THEN XP=SL ELSE XP=SR
550 IF YP<ST THEN YM=-YM
    :SOUND 4050,2
    :YP=ST ELSE IF YP>SB THEN 240
560 GOTO 350
570 '
580 ' ======================
590 ' On the paddle's row
600 '
610 IF ABS(XP-BC)<=14 THEN YM=-YM
    :XM=XM+(XP-BC)*XL+(RND(1)-.5)/8
    :SOUND 3900,2
    :GOTO 350
620 '
630 ' ======================
640 ' On a brick's row
650 '
660 XV=(XP+7)\16
    :YV=YP\4
    :IF (XP+7) MOD 16>14 OR BX(XV,YV)=0 THEN 350
670 LINE(XV*16-7,YV*4)-(XV*16+6,YV*4+1),0,B
    :SC=SC+3*(15-YV)+7
    :PRINT @42, "Score:";SC;
    :SOUND 2000+200*(15-YV),2
    :YM=-YM
    :BX(XV,YV)=0
    :CT=CT-1
    :IF CT=4 THEN SOUND 4100,3
    :SOUND 4200,3
    :SOUND 4300,3
    :XL=XL+.2
    :SC=SC+1000
    :GOTO 270 ELSE 350
```

Give your Model 100

128K RAM

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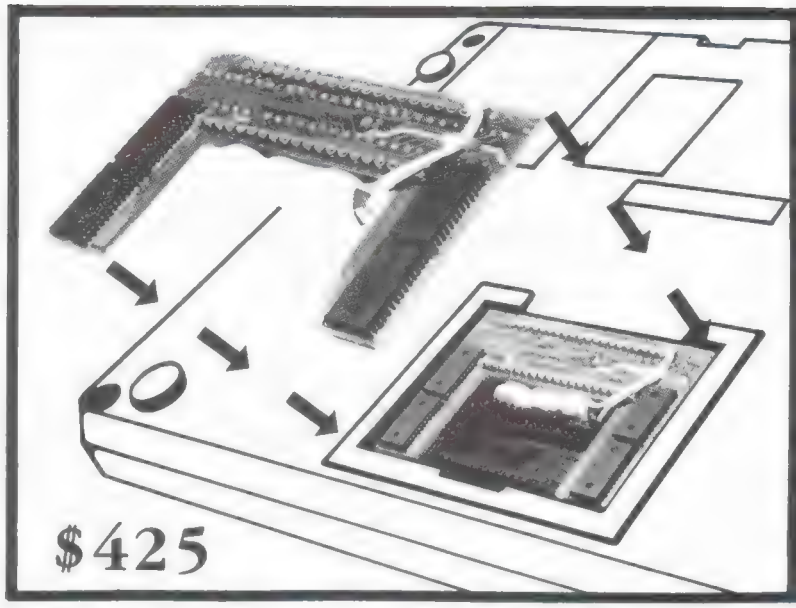

Software included, transfers from bank to bank. Works like main menu! Includes powerful RAM Basic that lets any program regard the 128K as one continuous bank.

PCSG says: Satisfaction guaranteed or your money back within 30 days

As amazing as it seems you can upgrade your Model 100 to 128K of RAM in just 60 seconds.

It comes to you right out of the box looking just like the picture. You just open the little compartment on the back of your Model 100 with a quarter and it just pushes right into place. You can then put the cover back in its place.

You then have 4 banks of RAM of 32K each. The additional three banks also work just like your Main Menu.

You push a function key and you are in the second bank. Push again and you are in third, again, then fourth. Press it once again for your original bank.

It has its own built-in NiCad battery that recharges right from the Model 100 and its guaranteed for a full year.

What is really great is that you can copy a file from one bank to another with just a function key.

Each bank is like having another Model 100, and all the built-in programs as well as any snap-in ROM programs appear in all four banks and work the same way. Your widebar cursor moves from file to file and you access any file or run any program just by pressing ENTER.

What lets you copy any file from one bank to another is a snap-in ROM from PCSG called RAM+, that comes at no extra charge. It just pushes right into the little socket in that same compartment with the 96K expansion unit.

Not only does this firmware let you copy a file from bank to bank, but you can make a copy of any file within the same bank instantly with a function key. Great for Lucid spreadsheets!

Copy a file from bank to bank with a function key

You can also rename a file, or kill any file with just a function key. Plus you can do a whole lot of other useful things like setting the date, day and time with function key ease. You even have a function key that lets you use non-Radio Shack printers without having to make those tricky dipswitch settings.

RAM+ lets you cold start any one of your banks without affecting the other three. That means that anytime you want you can clean out a bank's entire memory, but leave intact all the files in the other banks.

What is also fantastic is that you don't have to have the ROM in place to use the additional RAM. Whenever you take out the snap-in ROM it leaves behind a tiny machine code program that lets you switch from bank to bank just by pressing ENTER.

This lets you use your ROM socket to snap-in other ROMS like LUCID spreadsheet, WRITE ROM text processor, or DISK+ ROM file transfer program, and use them in any or all four banks. All of these, by the way, are available from PCSG.

When you are ready to copy a file from one bank to another or use any of the other fantastic functions we talked about you can just snap the RAM+ ROM back into place.

Everybody that has this 128K system in their Model 100 is so excited, because it gives them four times the capacity and all banks work just like the Main Menu.

And what has made a lot of people happy is that the system bus, located in the same compartment, is left free for you to plug in a DVI or the Holmes Engineering/PCSG portable disk drive.

The ability to copy a file from bank to bank instantly with a function key, plus all of the other features make this RAM extension truly an engineering masterpiece.

Some people hesitate when they think of installing something, and then others are skeptical that any additional hardware could be as good as the Model 100 itself. That's why we sell these 96K expansions on a 30 day trial. Simply return it within 30 days for a full refund if you are not satisfied. Priced at $425. MC VISA COD.

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The above description is for the Model 100. Versions are also available for the Apple II and the IBM-PC on diskette. The Model 100 version is on cassette tape. Send $29.95 (specify version) plus $2 for shipping and handling to:

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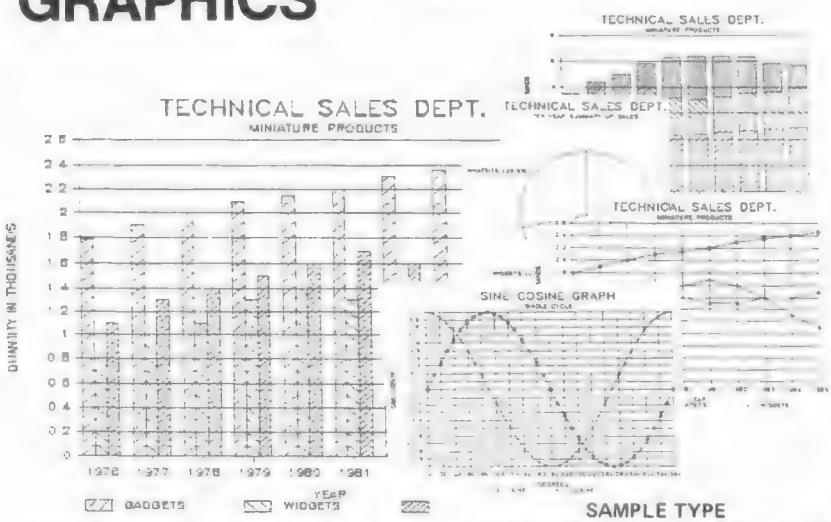

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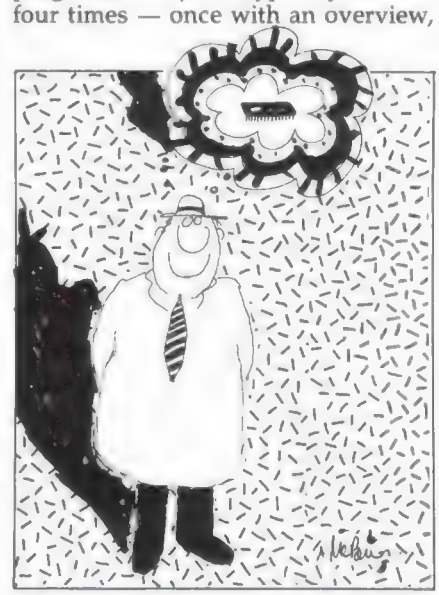
SUPER ROM (from page 29)

those supplied with the previously released programs. However, the Thought/Lucid Data manual has a front section detailing the Super ROM enhancements to Lucid and Write ROM.

Super ROM's manuals are well written with copious use of examples. Each program or subject is typically covered four times — once with an overview,



once in a tutorial, once in a technical reference and finally in a pocket reference card. Each manual is indexed, providing a fifth way to find answers to questions.

Command trees also help you find your way in and out of the various menus and submenus. They are also useful in helping you realize the existence of software features you might not have learned of if, like me, you tend to skip around in the manuals rather than plow through from front to back.

Like other PCSG manuals, Super ROM's documentation contains hyperbolic adjectives like "wonderful," and "marvelous," on almost every page. You get used to that right away and realize the enthusiasm of the manual's writer is understandable: the software is *very* good. Nonetheless they could still make their point with a little less fanfare.

A WRITER'S TOOL

Super ROM's text formatter called Write ROM was released as a separate product this past summer. It supports both parallel and serial printers. The dot commands are largely the same as those in Wordstar, so many text documents may be passed with embedded dot commands between the laptop and

a desktop machine for printing.

Write ROM was favorably reviewed in the August 1985 issue of *Portable 100*, and points made then still apply. Simply put, it's easy to learn and it's fast. There's a global search-and-replace function, a pixel-map preview showing how the printed page will be laid out and a character-counter. Also, a mail-merge capability is built in.

With Write ROM you can embed the current date, time or day in any printout by putting a simple code in your document. You can also embed words or paragraphs from a library file by inserting single graph characters. For frequently used text this is a great memory saver.

Best of all, you needn't learn every last feature to start using Write ROM. Global formatting parameters let you print documents right away, leaving you to learn the dot commands at your leisure.

A particularly handy and clever feature of Write ROM is the capability to go back and forth between TEXT with a single keystroke. When you push F8 to get out of TEXT, you find yourself back in Write ROM for printing.

Another nice feature is that if you get into TEXT via Super ROM, you can turn the power off and back on without losing your place in the file.

THE LUCID EXPERIENCE

Super ROM's spreadsheet is Lucid — given a rave review in the March 1985 issue of *Portable 100*. The comments made then still apply — it's powerful, recalculates quickly, economizes on RAM and allows you to look up values in other spreadsheet files. Formulas and values may be replicated with relative and/or absolute cell references. Recalculation is always manual.

The fact that Lucid uses little RAM other than the cell contents means that quite a large spreadsheet can fit into your laptop. You can only view a few rows and columns at a time and there's no windowing, but this is the fault of the Model 100's small screen — not Lucid. Lucid has been on the market long enough that most of its bugs have been worked out.

Lucid on Super ROM has enhancements going beyond what's offered on the standalone chip. For example, Super ROM's Lucid has a Find feature allowing you to search for a string of letters or numbers in the spreadsheet. It also has a sorting function that lets you sort by rows or columns either al-

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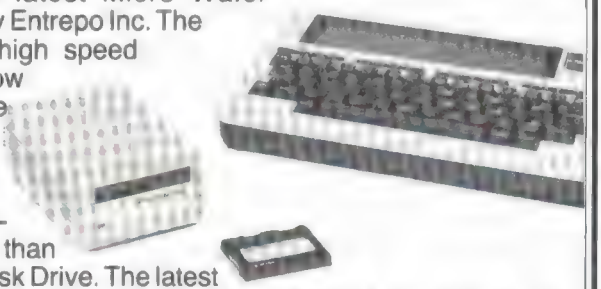

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The 100's compact operating system is smaller than that of the Radio Shack Disk Drive. The latest release of the operating system may be down loaded by calling the computer at A&J Micro Drive using the simple instructions included with the unit.

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Manufacturer's Specifications

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Sunnyvale, CA 94086
(408) 732-9292

Price: $89.95

Baud Rate: 14,000 bits/second
Tape Speed: 10 inches/second
Capacity: 1.5K bytes/foot tape
10' = 15K bytes
62' = 100 K bytes
Lengths: 10, 20, 35, 50, & 62'
Power Supply: 4 "AA" cells
Connection: Uses RS-232 port
Cable: 30 inch RS-232 attached
Size: 6 x 4 x 2.5 inches
Weight: 24 ounces

STILL INTERESTED

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phabetically or numerically.

Data can be put into and taken out of a spreadsheet file by means of conventional .DO files, thus aiding in the interchange of data with other programs outside of Super ROM. Control-down arrow now takes you to the lower right corner of the spreadsheet.

There have also been cosmetic improvements to Lucid. The Select process, which annoyingly repainted the screen for each row or column added to the selected area, now yields a smoothy expanding reverse video region. If you leave the spreadsheet and return, your location within the spreadsheet will be maintained.

The internal format of .CA (spreadsheet) files differs between the original Lucid and the one in Super ROM. Super ROM Lucid will read in and convert a .CA file previously created by standalone Lucid. However, once converted, the .CA file cannot be used with standalone Lucid again. This is likely to be a problem since you can use Super ROM Lucid to do everything standalone Lucid did — and more.

NEW KIDS ON THE BLOCK

Super ROM's outliner is called Thought. It's designed to be much like Think Tank, the well-known outliner from Living Videotext. Thought is designed to allow easy transfer of outlines between the Model 100 and a desktop machine equipped with Think Tank.

Like Traveling Software's Idea, the other ROM-based outliner for the Model 100, Thought is designed to make it easy for you to keep track of your thoughts and ideas. Just as you keep track of text in a word processor and keep track of numbers in a spreadsheet, an outliner helps you keep track of topics and subtopics.

Thought lets you set up main topics, subtopics and so on. When you cut and paste a main topic, its subtopics come along with no extra effort. You can view the whole outline or suppress printing of sublevels. A one line topic can be a pointer to a .DO file on that topic. An entry may be "cloned" into other regions of the outline. Changing it in one area automatically updates it in another.

Additionally, you can get information into and out of the outline in the form of normal ASCII files, easing the interchange of data with programs unrelated to Super ROM.

Super ROM provides powerful rou-

tines for loading information into and out of database files. Data is stored in Lucid spreadsheets, so you can use Lucid to edit and sort the information. User-friendly data entry screens may be set up without having to learn a programming language, and reports may be generated just as easily.

You can print invoices, mailing labels or form letters from information

> The manuals are well written with copious use of examples.

stored in the computer. The database software is relational, meaning that information in one cell of a database may be used to extract related information from a second data base. This allows for economical use of precious RAM space since information which normally would be duplicated can be entered in one database with pointers tying it into another.

The Lucid Data report generator lets you print up to four labels across on a page. You can print information which has been extracted on various conditions, and which has been sorted on the field of your choice.

It bodes well for Super ROM users that PCSG's phone number appears prominently on the cover of each manual. Because Lucid and Write ROM have been on the market for some time, their tech support person is no doubt quite good at helping users. Thought and Lucid Data are both new but experience suggests that support is likely to be good after a period of getting up to speed.

The software is up to version 1.4, and earlier versions will be upgraded free of charge, says PCSG.

Copy protection is not really an issue here. The ROM chip is sturdy and is not prone to accidental erasure as are cassettes and disks; you're not likely to need a backup to guard against such loss. If the chip were stolen you'd be out of luck, but if it were merely damaged you could probably convince PCSG to exchange it for a new one.

Super ROM is a good buy. If you're at all inclined you should at least take PCSG up on their 30-day money back trial offer.□

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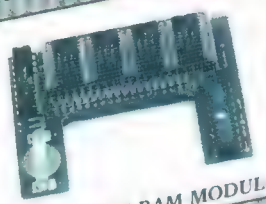
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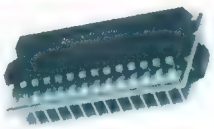
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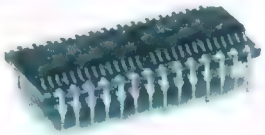
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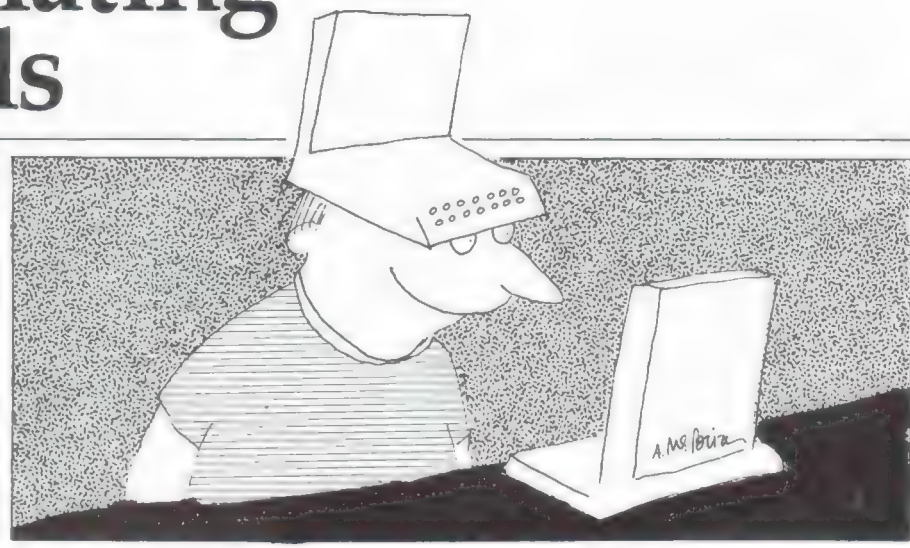

I wrote CALC because I couldn't find a calculator program that I felt was easy to use. Of all the general purpose programs I'd seen, most either had too many unneeded features or they required multiple key strokes to accomplish even simple addition.

Why not buy a five dollar calculator available from any supermarket? First of all, a calculator is merely a tiny preprogrammed computer, dedicated to the task of mathematic operations. The Model 100 is able to simulate most any dedicated microprocessor-based device via its ability to be programmed. So why bother carrying around a calculator when the capability is already built into the computer?

Secondly, if I'm running a database or spreadsheet program in front of a client and I need to do a quick calculation, it would seem almost ludicrous to reach into my pocket and pull out a simple calculator when a full-featured computer is sitting in my lap.

Hence, CALC. A graphic simulation of a pocket calculator that allows easy entry, familiar operation and a pleasing display. Actually the only way in which this program differs from a real pocket calculator is in resolution. Most pocket calculators display only eight digits, but the Model 100 is capable of sixteen digit, double precision operations. I've made use of the double full precision in this program instead of rounding down to eight digits. When working with very large numbers the display may overrun the CALC keypad. Nothing to worry about though, the display will be restored when you use the CLEAR command. If this is annoying or you just don't need 16 digit resolution, a round-off routine can easily be added.

CALC supports addition, subtraction, multiplication, division, square root, percent, clear and clear entry. Numeric input is accomplished by pressing either the number keys on the top row of the keyboard, or by using the numeric keypad built into the middle of the keyboard. You may input numbers from the numeric keypad whether NUM key is up or down, but entry is slightly faster with it down because the program doesn't have to convert the alpha input to numerals.

To execute an operation, simply press the appropriate legend key (i.e. "+" is addition, "-" is subtraction and so on). The legend keys are scattered around the keyboard, however, and some even require that the shift key be pressed; this can slow down the input. I have programmed the arrow keys to act in the following manner, from left to right: Plus, Minus, Multiply, Divide. I urge you to become familiar with the use of the arrow keys, as they really make things much easier.

The S key is square root, P is percent, the C key and spacebar clear the display, and the Enter key is the same as an equals sign. All keys work with the caps lock either on or off.

The last digit entered may be deleted using the DEL key. Pressing it many times will clear that particular entry. This is handy if you hit the wrong key and don't want to re-enter the entire number again. The ESC key will escape the program and return to the main menu.

Looking at a listing of the program you may notice the undefined variable OF. This was included to allow the user to place the calculator anywhere on the screen. Adding the line:

```
1 OF = 10
```

will place the display on the right side of the screen. Making the variable value -10 will put the display on the left. The offset can be any number between -12 and +12. If you leave this variable undefined it will default to zero and the display will remain in the middle of the screen.

The offset was added to allow CALC to be included in your own programs and called as a subroutine when needed. Moving the display will let you print your own pertinent information on the screen (account numbers, figures to be added or whatever) while the calculator is being used.

To prepare CALC to be used in your own program as a subroutine, first change MENU in line 64 to RETURN. This will return control to your program when ESC is pressed instead of going to the menu. Then renumber the CALC program using a renumber utility. Make sure the new starting line number of CALC is higher then the last line in your program. Merge the programs, add a GOSUB when you want to call CALC and you're ready to go.

Perfectionists will note that when multiplying or dividing by zero the display is different than expected. I didn't add a routine to check for this because I wanted to keep the program length to a minumum.

In general, operation is like that of a standard pocket calculator. Of course each brand of calculator has it's own peculiarities of operation and this program is no exception. However, after a minute or two of use, you'll quickly become familiar with the program's idiosyncrasies and will then be able to do most any calculation normally done with a pocket calculator.

— Andy Barbola

Listing begins on page 61

SUPER ROM

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Lucid Spreadsheet: This is the one PICO magazine says "blows Multiplan right out of the socket" and Infoworld performance rated as "excellent" and said "makes the Model 100 compute." Gives you features you cannot get with Lotus 123. Lets you build spreadsheets in your Model 100 that would consume 140-150K on a desktop. Program generating capability with no programming knowledge required. Variable column widths. Includes find and sort with function key control. It's fast, recalculates like lightning. No feature has been taken from the original, only new ones added.

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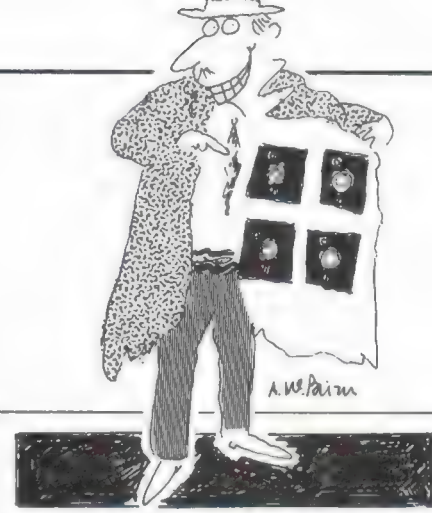
CALC.BA, an easy to use six-function calculator program for the Model 100. It also works on the Tandy 200.

```
 4  ON ERROR GOTO 72
   :C$=CHR$(29)+"+"+CHR$(28)
    +"-"+CHR$(30)+"*"+CHR$(31)
    +"/"+CHR$(13)+
    "=SsPp%1234567890.Cc "+
    CHR$(27)+CHR$(8)+
    "MJKLUIOmjkluio"
   :DIM B(18)
   :GOSUB 84
 6  GOSUB 66
   :GOSUB 68
 8  I$=INKEY$
   :IF I$="" THEN 8
 10 ON INSTR(C$,I$) GOTO 20,
    20,22,22,26,26,34,34,40,
    40,44,44,48,48,48,12,12,
    12,12,12,12,12,12,12,12,
    56,52,52,52,64,54,80,80,
    80,80,80,80,80,80,80,80,
    80,80,80,80
   :GOTO 8
 12 IF FG THEN GOSUB 68
 14 A$=A$+I$
   :P=VAL(I$)
   :KP=1
   :GOSUB 74
   :IF LEN(A$)>8+FL OR EF THEN
    8
 16 D=VAL(A$)
 18 PRINT @L-LEN(A$),A$;
   :GOTO 8
 20 S$="+"
   :P=10
   :GOSUB 76
   :GOSUB 62
   :TA=D
   :D=TB+D
   :TB=TB+TA
   :GOTO 58
 22 S$="-"
   :P=11
   :GOSUB 76
   :IF TB=0 AND LP$=S$ THEN 24
    ELSE IF TB=0 THEN TB=D
   :GOTO 58
 24 GOSUB 62
   :TA=D
   :D=TB-D
   :TB=TB-TA
   :GOTO 58
 26 S$="*"
   :P=12
   :GOSUB 76
   :IF TB=0 THEN TB=1
   :GOTO 32
 28 IF D=0 AND LP$<>S$ THEN
    D=TB
   :GOTO 58
 30 IF D=0 AND LP$=S$ AND KP
    THEN D=TB ELSE IF D=0 THEN
    D=1
 32 TA=D
   :D=TB*D
   :TB=TB*TA
   :GOTO 58
 34 S$="/"
   :P=13
   :GOSUB 76
   :IF TB=0 THEN TB=D
   :D=1 ELSE IF D=0 THEN D=TB
 36 IF TB=D AND KP=0 THEN 58
 38 TA=D
   :D=TB/D
   :TB=TB/TA
   :GOTO 58
 40 S$="="
   :P=14
   :GOSUB 76
 42 KP=1
   :ON INSTR("+-*/",LP$) GOTO
    20,22,26,34
 44 S$="          "
   :P=15
   :GOSUB 76
   :IF D=0 THEN D=TB
 46 TB=SQR(D)
   :D=TB
   :GOTO 58
 48 S$="%"
   :P=16
   :GOSUB 76
   :D=D/100
   :IF LP$="+" OR LP$="-" THEN
    D=TB*D
 50 GOTO 42
 52 S$="C"
   :P=17
   :GOSUB 76
   :GOTO 6
 54 IF D=0 THEN 8 ELSE S$="C"
   :P=17
   :GOSUB 76
   :A$=LEFT$(A$,LEN(A$)-1)
   :GOSUB 70
   :GOTO 16
 56 IF FL=0 THEN FL=1
   :FP=1
   :S$="."
   :P=18
   :GOSUB 76
   :GOTO 12 ELSE I$=""
   :GOTO 8
 58 IF EF THEN ERR ELSE FG=1
   :A$=STR$(D)
 60 GOSUB 70
   :D=0
   :KP=0
   :LP$=S$
   :GOTO 18
 62 IF A$<>"0" AND D=0 AND KP
    THEN D=TA
   :RETURN ELSE RETURN
 64 MENU
 66 TA=0
   :TB=0
   :D=0
   :LP$=""
   :EF=0
   :RETURN
 68 FL=0
   :FG=0
   :A$=""
 70 PRINT @L-20,
    "          u          0";
   :RETURN
 72 BEEP
   :GOSUB 66
   :GOSUB 68
   :EF=1
   :A$="ERROR"
   :RESUME 18
 74 IF FP THEN FP=0
   :RETURN ELSE
   S$=RIGHT$(STR$(P),1)
 76 IF P=PO THEN RETURN
 78 PRINT
   @B(P),CHR$(27)+"p"+S$;
   :PRINT
   @B(PO),CHR$(27)+"q"+SO$;
   :PO=P
   :SO$=S$
   :RETURN
 80 Q=INSTR(RIGHT$(C$,14),
    I$)-1
   :IF Q>6 THEN Q=Q-7
 82 I$=RIGHT$(STR$(Q),1)
   :GOTO 12
 84 FOR K=0 TO 18
   :READ J
   :B(K)=J+OF
   :NEXT
   :DATA 256,216,218,220,176,
    178,180,136,138,140,224,
    262,144,184,264,142,182,
    260,258
 86 CLS
   :L=65+OF
   :X=14+OF
   :PRINT TAB(X)"pqqqqqqqqqqr"
   :PRINT TAB(X)"u          u"
   :PRINT TAB(X)"tqqqqqqqqqqy"
   :PRINT TAB(X)"u 7 8 9    *u"
   :PRINT TAB(X)"u 4 5 6 % /u"
   :PRINT TAB(X)"u 1 2 3    +u"
   :PRINT TAB(X)"u 0 . C - =u"
   :PRINT TAB(X)"vqqqqqqqqqqw"
   :RETURN
```

For Whom Integers Toll



During the past year, I've written a monthly column for *Portable 100* called TELCOM. Although TELCOM is well received, the editors have become concerned that by concentrating so much of our efforts on telecommunications, we're neglecting other important aspects of the Model 100 and Tandy 200. The result: a new column called MAXRAM.

Don't despair, TELCOM fans — I'll still cover telecommunications issues. But there'll also be BASIC programming suggestions, tours of novel applications and answers to your questions in the mix.

Speaking of which, if you've developed an unusual algorithm, have a programming question or would like a technical point explained, drop a note to MAXRAM, P.O. Box 250, Camden, ME 04843.

INTEGRAL FUN

Taking the integral value of something — changing 4.3 to 4 — is an amazingly common programming function. The computer does it internally all the time: if you told it to PSET (10.5, 15.3), it would *truncate,* or ignore, the decimal places and plot a point at coordinates (10, 15).

Sometimes, the process for converting a number into an integer is disguised. For example, after a compound-interest calculation, you want to define a variable as an exact number of dollars and cents. Since you're using double-precision numbers (recommended when accuracy is crucial), you might well be left with $1,254.3163.

Turning value into an integer by using the built-in INT function won't help — that would give us exactly $1,254. The trick: Multiply the value by 100, use the integer function and divide by 100 again. If the number is in the variable DL, use:

```
100 DT = INT(DL * 100) / 100
```

to yield $1,254.31. But wait. We have 61/100 of a cent, and that should be rounded up to an even penny. We want to round, not truncate. The trick is to add one half (.5) to a number before feeding it into the INT function:

```
100 DT = INT(DL * 100 + .5) / 100
```

That statement assigns DT the value 1,254.32.

TO FIX OR INT

The Model 100 and Tandy 200 manuals list more than one conversion-to-integer function. In fact there are three: INT, FIX and CINT. INT and CINT are called "conversion to integer" and FIX is termed "truncate to whole number."

Let's compare the operation of these functions with a short program:

```
10 DEFINT A, DEFDBL Z
20 FOR A = 1 TO 5
30 READ Z
40 PRINT Z; INT(Z); FIX(Z); CINT(Z)
50 NEXT A
60 DATA 3153.424, 0, -1, -21.563, 50000.9
```

All three functions do as expected with the first data value, returning a result of 3153. They also return 0 and -1 when given these whole numbers. But with an input value of -21.563, an interesting thing happens: FIX and CINT return -21, while INT produces -22.

The reason for INT's deviation is given in the computer's owner's manual. INT returns the whole number less than or equal to the input value — and on the number line (remember those?) -22 is the whole number less than -21.563.

FIX and CINT, on the other hand, simply truncate or ignore any decimal places. If you drop the .563 from -21.563, the answer is -21.

Which method is right? They both are, depending on your application. I usually find that FIX provides the answer that I'm expecting. But your experience may differ, depending on what you intend to do with the output of the function.

We have one more data item: 50,000.9. Both INT and FIX return a nice, even 50,000 — but the CINT statement causes an OV?, or overflow error message.

That's because CINT is designed to compress a single- or double-precision real number into an integer's format. Since integers are limited in range from -32,768 to 32,767, the input value must also be in that range.

INTEGER DIVISION

I'll confess I know a fourth way to convert numbers to integers. It takes advantage of an infrequently-used function: the backslash, \, which is called "integer division." The owner's manual is a bit vague about integer division (which, by the way, is keyed in as Ctrl-Hyphen). In the Model 100 manual, the operator is introduced on page 107 and a quick example is given on page 108. The book implies that the operation is just like normal division except that the decimal portion of the quotient is truncated.

Let's give it a try. Printing 101.231\1 yields 101 — that's fine. Printing -21.6\1 produces -21, so that integer division works just like the FIX function.

Or does it? 50000.9\1 gives the same OV? error, making the backslash more like the CINT function — that is, only useful for numbers between -32,768 and 32,767. That may be sufficient.

The integer-division example in the Model 100 manual is 10\3 = 3 — which is true. The manual and the tests earlier in this article give the impression that 10\3=FIX(10/3). Right?

Wrong. Let's try something: If 10.5/1.5 is equal to seven (try it!), then 10.5\1.5 should also equal seven. But no: Model 100 BASIC says the answer is ten.

The laptop BASIC manuals should specify that the backslash signifies *integer division of integers.* BASIC truncates (using an internal version of the CINT function) the answers before executing the division. That's two truncations. Then it divides the integers. So what we have is a case of CINT(CINT (10.5)/CINT(1.5)). That reduces to CINT(10/1), or 10.

— Alan L Zeichick

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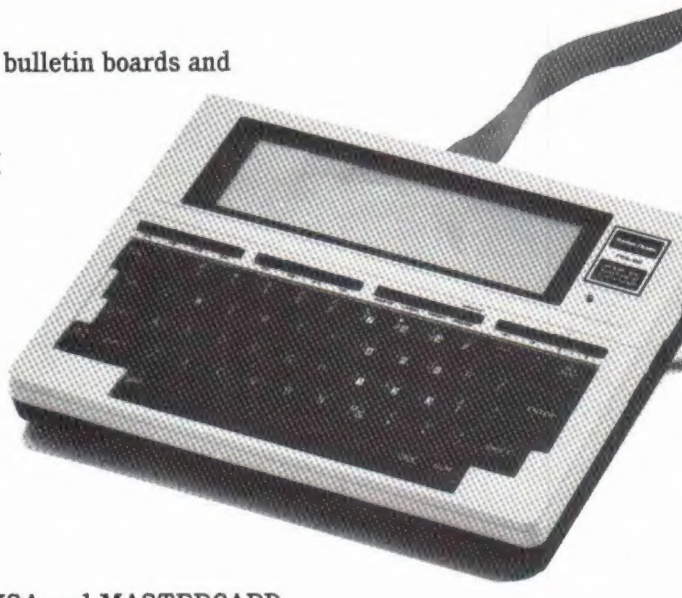

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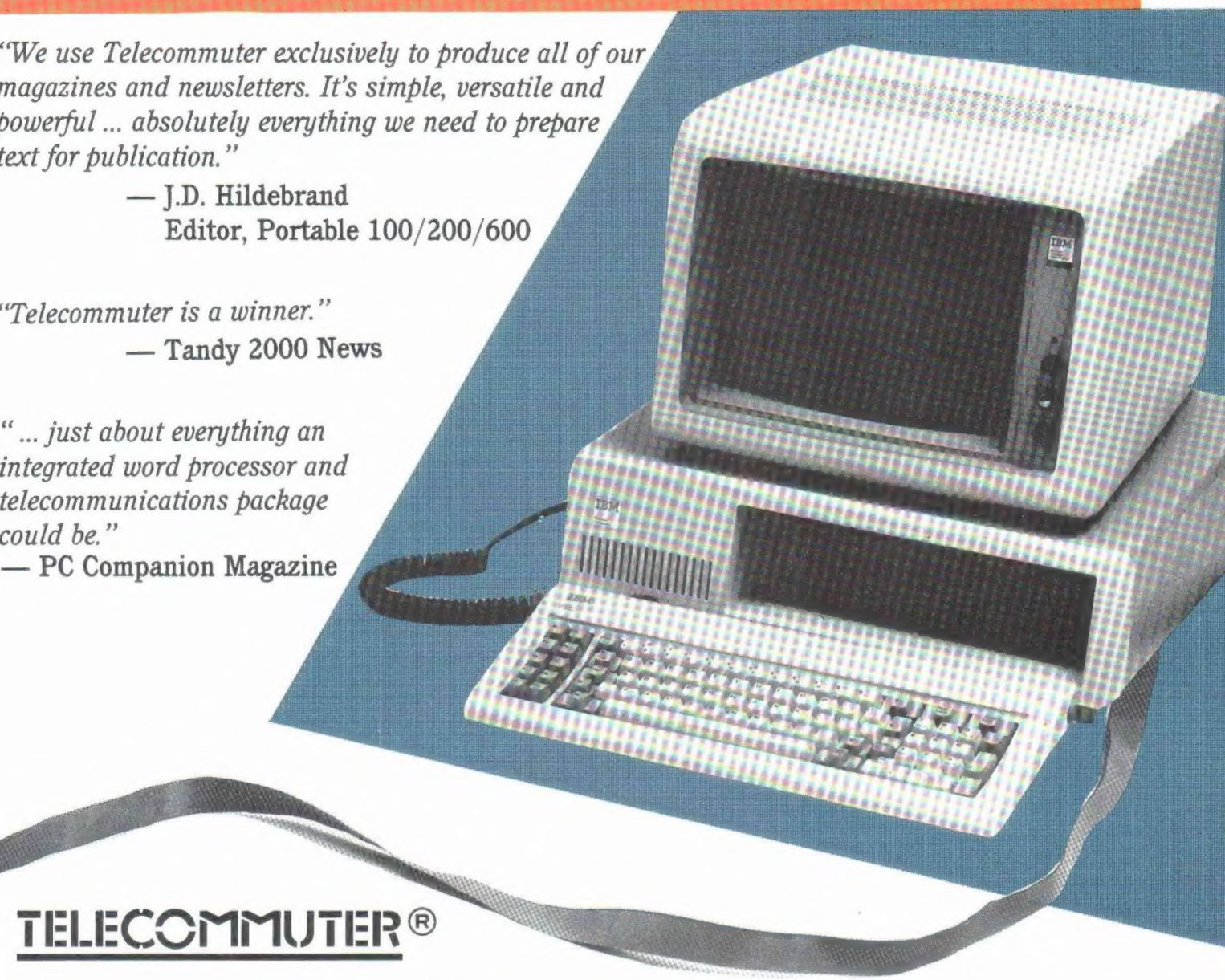

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THE SECOND BARRIER

Until now, the Tandy and NEC laptop computers were not easily used with IBM desktop computers. Traveling Software has broken this barrier with a product called "LAPDOS," which allows the Tandy portable 3½" disk drive to be plugged into and used with any IBM PC or compatible with a serial port. LAPDOS can be operated as a RAM-resident utility on your IBM, which means you can call it up with two keystrokes while using your favorite word processor, spreadsheet, or other software. You could be in the middle of Wordstar, for example, and read in any text files from your portable disk drive.

LAPDOS allows you to easily use your database, spreadsheet, or word processing files while on the road with your Tandy or NEC laptop computer. In fact, LAPDOS includes a program called "The Exchanger" which allows you to use ThinkTank and Sidekick files with the IDEA! outline processor available from Traveling Software on a software chip called The Ultimate ROM II.

LAPDOS is only $89.95, which includes a special hardware adapter which allows the disk drive to plug into any IBM PC or compatible computer with a serial RS232 port. The LAPDOS software comes on an IBM 5¼" disk with a complete owner's manual. And if you already own the Ultimate ROM II, or are purchasing it now, you will receive a $20 discount off the cost of LAPDOS.

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